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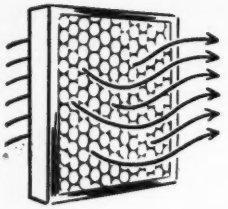
2 AIR SUPPLY SYSTEM



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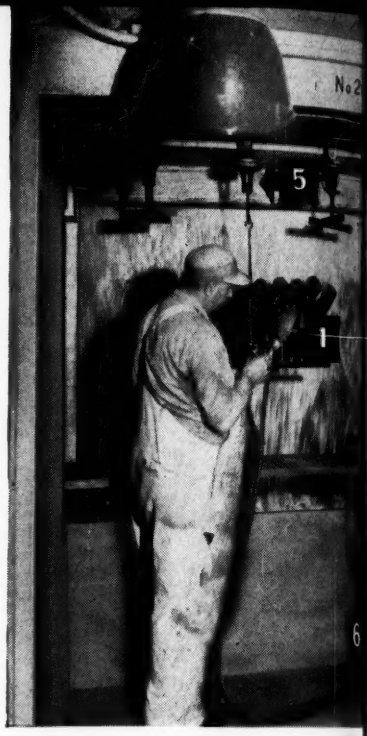
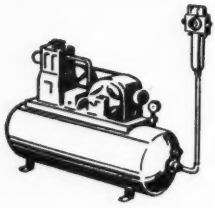


4 COMPRESSED AIR



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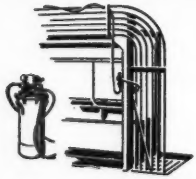
6 MATERIAL HANDLING



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Products Finishing

Specifications -- Quality Defined...

Proper understanding between the manufacturer of metal products and the electroplater on the meaning of plating specifications can help to raise the general standard of quality for all electroplated finishes. Modern electroplating specifications are intended to be a guide in defining exactly the kind of plate needed and that the plating fits the requirements.

In most cases, electroplated coatings are applied because they have different properties than the base metal, especially, greater resistance to tarnish; or because they protect the base metal against corrosion. Even when appearance is a primary consideration, protection against corrosion is also significant. Many years have been required to demonstrate that service conditions are the primary factors in the corrosion resistance of the commercial forms of iron and steel. In addition to defining the requirements of the corrosion job that the coating must do, it is just as important that the specifications be fitted, so far as possible, to the needs of the ultimate user, the designer, the purchasing agent, the plater, and the inspector.

The first step in drawing up specifications is to determine what is required of the coating; that is, what specific properties must be maintained. For example, coatings for corrosion resistance will only need certain protective qualities. Coatings for decorative purposes will have definite appearance requirements, as well as corrosion resistance requirements. Certain problems of this type can oftentimes be met best by specifying the metal to be used or nature of the deposit, since metals and sequence of coatings will, under most conditions, retain inherent properties. The procedure to be used in plating the parts is often found to be a helpful addition to the specifications, since this restriction will make for uniformity in the quality of the metal deposit produced. Also, the method for treatment of parts prior to plating may be an essential part of the specification, since the final result is often related to the condition of the metal surface prior to the deposit of the first coat.

The manufacturer of metal products in preparing plating specifications should keep in mind that a satisfactory plating specification is one which, if strictly followed in the plating department, will provide a product of uniformly acceptable performance and will not require any unnecessary tests for quality. This type of coating specification is quality defined at the lowest cost.

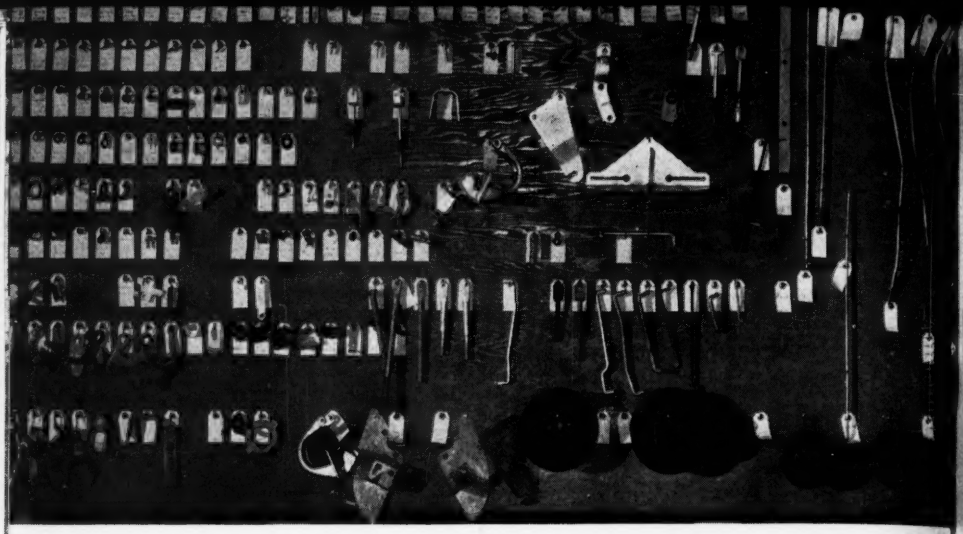


Fig. 1—All of these parts for Buick chassis are either plated (mostly with zinc) or are given (parts dark in color) a Parker Lubrite treatment.

Rapid Small Parts Handling Features Buick Plating Setup

Bright zinc is applied to chassis parts both in automatic barrel and racked part lines. Cadmium plating and phosphating are done efficiently.

By HERBERT CHASE

SCORES of small chassis parts, as shown in Fig. 1, including bolts, nut, clevices, stampings, and forgings, employed in Buick cars are rendered rust resistant by plating and phosphating treatments in a newly equipped department of the Flint plant in which cars of this make are produced. Much has been done in this layout to effect economy in handling and labor, as well as to ensure the thickness and the quality of the coating required under exacting specifications.

All parts adapted to barrel plating (except for a small number on which

Fig. 2—Portion of the line in which parts having light scale are treated for scale removal, in barrels, before being plated

cadmium is specified) are passed through a Stevens barrel plating machine in which Udylite bright zinc plating is done. Prior to this plating, however, parts that have any scale are processed through a pickle line in a barrel handled by an electric hoist, as shown in Fig. 2. In this line, the parts are first given a 20-min. soak in an alkaline solution containing 8 to 12 oz. per gal. of Orthosil at 180 deg. F., followed by a cold rinse and then by a 12 to 20-min. soak in a 10 per cent solution of sulphuric acid at 180 deg. F. Next comes a cold rinse and then a 10-min. soak in 4 oz. per gal. Orthosil solution to prevent rusting of the parts before plating. Electric timers, operating bells, and light signals control the shifts on this line.

The barrel plating machine, as shown in Figs. 3 and 4, utilizes inclined perforated drums that turn with the supporting shaft only when tilted downward into the successive tanks. In the downward position, a worm wheel on each shaft engages one of two driving worm shafts that run the length of the machine. When shifts from tank to tank occur, the barrels are tilted upward and the worm wheels disengage so that barrel rotation stops. The barrels are conical in shape and are made from perforated steel coated with synthetic rubber.

Timing in the barrel plating machine in which 16 barrels are employed is such that barrel shifts occur each 1½ min. or multiples thereof, the longest dwell in any tank being 24 minutes. In other words, one barrel goes into and one out of each tank each 1½ min. but in several tanks two or more barrels are submerged simultaneously. The sequence through this machine is as follows:

Fig. 3 — Parts to be barrel plated are loaded from bins at left and, after plating, are discharged down the chute at right into tote boxes on a roller conveyor.

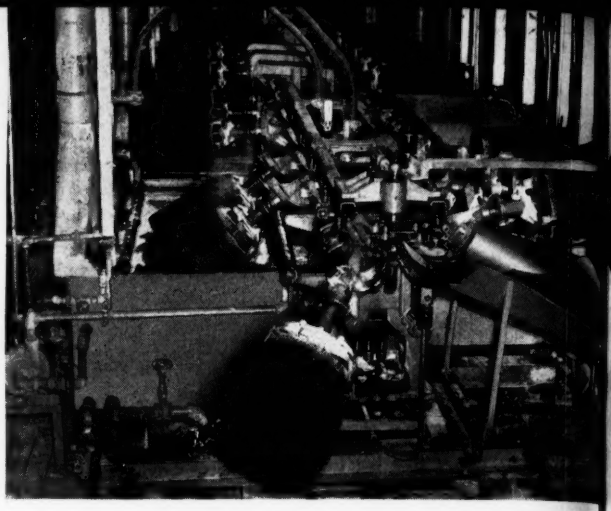


Fig. 4—General view of the automatic barrel plating machine. Barrel in foreground is lowered for filling. After passing through the machine, barrels dump into the chute at right.

1. Clean electrolytically 3 min. in 6 oz. per gal. of Orthosil at 180 deg. F., with solution circulated.

2. Cold dip rinse 1½ min.

3. Etch 4½ min. in 10 per cent sulphuric acid at 160 deg F.

4. and 5. Cold dip rinse (twice) in water that is circulated.

6. Bright zinc plate at about 50 amp. per sq. ft. in Udylite zinc salt solution containing a brightener. The solution is maintained at room temperature and continuously circulated and filtered, as later explained.

7. Cold rinse in two tanks 1½ min. each.

8. Hot rinse 1½ min.

9. Dry in tunnel heated to 140 deg. F. by steam-fed fan heaters.

10. Discharge with barrel elevated so that parts fall down a chute into a pan onto a weighing section of roller conveyor.

Each barrel holds 18 to 30 lb. of parts, depending upon their bulk and shape. Parts which are not well adapted to barrel plating are handled on racks through the Stevens machine shown in Fig. 5, designed, of course, for handling racks which are loaded and unloaded by hand. The parts which require racking are larger and of more complex shape than those which are barrel plated, some being assembled from stampings that are welded together. The sequence through this machine is as follows:

1. Clean cathodically in an alkaline solution containing 6 oz. per gal. of Orthosil heated to 180 deg. F. 4½ min.

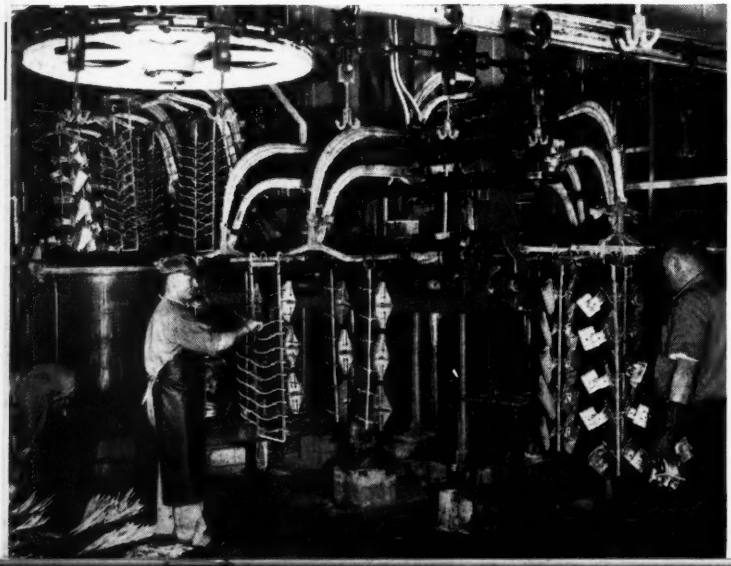
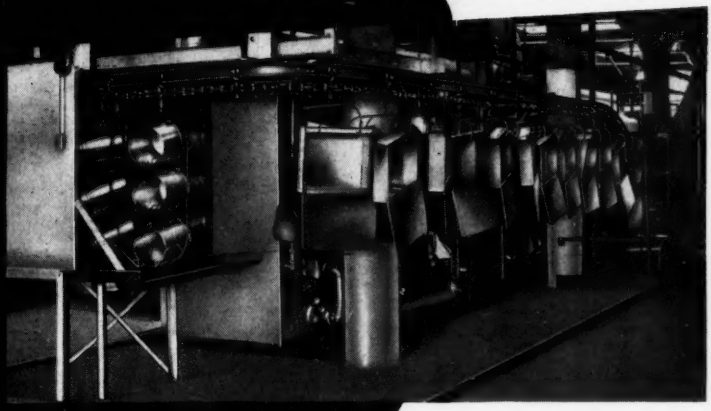


Fig. 5—Station where racks are loaded and unloaded at the end of Stevens machine in which the parts are zinc plated

...throom Cabinets



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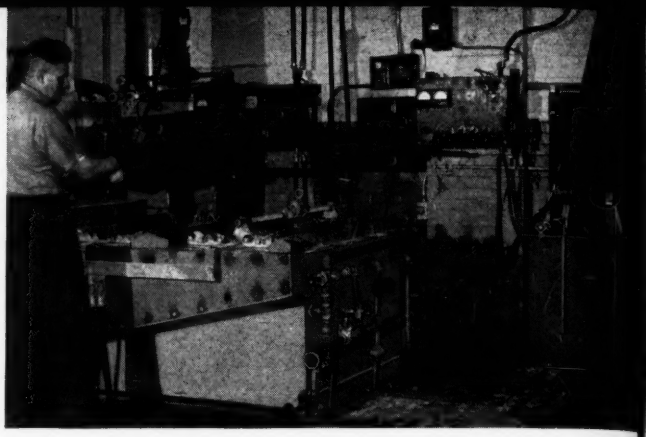

Fig. 6 — View of the reserve plating line showing a Hanson-Van Winkle-Munning zinc barrel plating tank at left and Udylite utility cadmium plating unit at right

at 9-volt potential.

2. Cold rinse dip and spray 1½ min.

3. Etch 1½ min. in 15 per cent (by wt.—50 per cent/vol.) muriatic acid dip with spray on top.

4. Cold dip rinse.

5. Cold dip and spray rinse.

6. Plate 9 min. in standard bright zinc Udylite solution at room temperature. Current density averages about 49 amp. per sq. ft. and the coating applied is about 0.0002 in. thick The solution is continuously circulated and filtered and is returned through a perforated pipe located in the bottom of the tank.

7. Cold rinse 1½ min.

8. Brighten by dip in solution containing 0.25 per cent/vol. nitric acid.

9. Cold rinse 1½ min.

10. Hot rinse 1½ min.

11. Unrack.

The overflow plating solution from the tanks in automatic plating lines is piped into several reservoir tanks from

Fig. 7—Another section of the reserve plating line with tank for zinc plating of racked parts at right and cleaning and rinsing tanks at left

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Fig. 9—Tank and equipment for cleaning parts in molten Kolene at 900 deg. F. and quenching. Operator at right looks through window to control hoist and also operates switches for changing polarity in the cleaning bath.

which Duriron pumps force the solution through Sparkler filters. From the filters, the solution is cooled in heat exchangers before being pumped back into the tanks. Make-up solution is prepared in two separate tanks which are equipped with propeller type mixing units and is then pumped into the work tank as needed.

Besides the two automatic lines, there is a reserve line, as shown in Figs. 6 and 7, arranged for handling both barrels and racks and intended for use only when one of the automatic lines is down temporarily or when batches of work have to be cadmium plated. This line has a trolley hoist for barrels and includes tanks for anodic alkaline cleaning, hot and cold rinsing, pickling in commercial muriatic acid (for parts that have a heavy scale), and plating both in bright zinc and in cadmium. The latter is employed for only a few barrel plated parts, such as screws, where a fairly close color match with chromium is required.

Parts that are barrel plated in the reserve line are dumped into a Ransohoff machine, as shown in Fig. 8, which includes a rotating cylinder having inside it helical ribs, which advance the parts through a water rinse and a screen where drying in hot air is done before the parts are discharged. Except for this machine, the

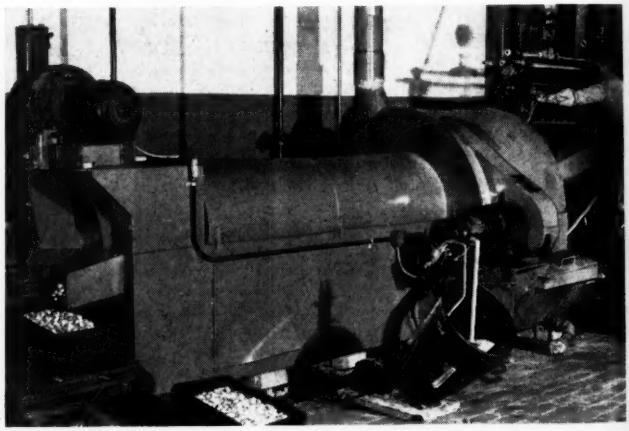

Fig. 8—Ransohoff machine for continuous rinsing and drying of parts that are dumped from plating barrel at right and emerge dry at left

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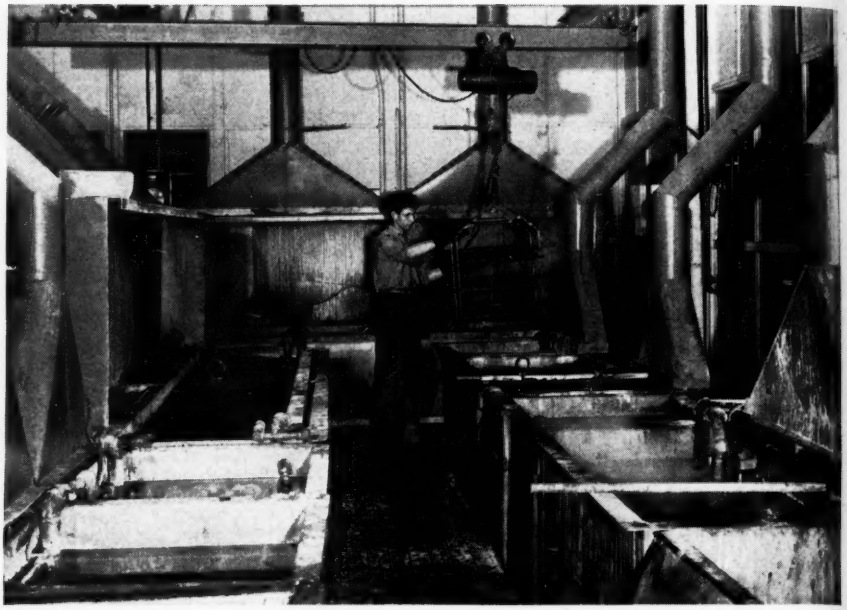

Fig. 10—Equipment for applying the Parker Lubrite treatment after cleaning racks of parts in tanks at right

reserve line is similiar to those often used for barrel or hand rack work. Zinc plating tanks are provided for both racks and barrels.

Although the entire plating setup is new, it includes recently added equipment, as shown in Fig. 9, for applying the Kolene cleaning treatment to parts that are heavily scaled or that have welds which require a very thorough cleaning to ensure good plating. Kolene is a salt which is heated until molten at 900 deg. F. Parts immersed in this salt bath are made anodic and cathodic alternately by an operator who stands outside a steel enclosure surrounding the tank holding the salt and one containing a water quench.

The operator views the work through a heat-resistant window and shifts switches as needed to change polarity. He also operates controls for a hoist which lifts the work into and out of the salt and quench tanks without opening doors until quenching is completed. This method of cleaning is designed to remove not only scale but any carbon on surfaces and is said to be so effective that even cast iron so treated is readily plated, as even pores are cleaned.

Parts such as torque tube balls and fan pulleys that are subject to mechanical wiping or abrasion in service are given the Parker Lubrite treatment during which an oil absorbent phosphate film is applied. This work is done in a separate room with tanks along two sides and one end served by two light cranes equipped with electric trolley hoists, as shown in Fig. 10. Parts are handled in racks resembling oblong baskets in general shape but so made that each part is on a separate support or pin.

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parts are degreased in trichlorethylene. This is followed by a 20-minute soak in an alkaline cleaner containing 4 oz. per gal. of Orthosil. After a cold rinse, a one-min. etch in 15 per cent muriatic acid, another cold rinse, and then a hot rinse, the racks of parts are given a 30 to 45-min. soak in the Lubrite phosphating solution. This is done in two tanks used alternately. The solution is heated to 210 deg. F. Two hot rinses follow. The parts are then given a quick dip in a soluble oil containing Aquadag, a deflocculated graphite, and heated to 140 deg. F. The porous Lubrite film absorbs the oil and deflocculated graphite and is quite resistant to abrasion besides inhibiting rust.

The plating setups are served by three generators. One of 6,000-amp. capacity feeds the barrel machine and the two others of 7,500-amp. capacity each serve the rack machine and cleaning line and the reserve line. A switch board is arranged so that any of the generators can be connected to lines other than those they normally feed if any of the generators go temporarily out of service.

It will thus be seen that excellent facilities for the work required are provided and that a large volume of parts can be processed with a minimum of labor. The latter is chiefly that of loading the barrels, loading and unloading racks, and shifting by trolley hoist those barrels not on the barrel machine.

Unichrome Coating 218, an elastic baking synthetic, the thickness of which can be varied by the application method, is described in a four-page bulletin issued by United Chromium, Inc., 51 E. 42nd St., New York 17, N. Y. Although dealing mostly with the application of the coating to electroplating racks, the information contained in the bulletin indicates advantages of the material for any use on any parts or equipment requiring extra-tough coatings. Copy free upon request.

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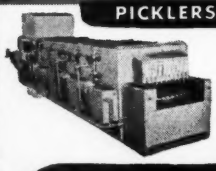
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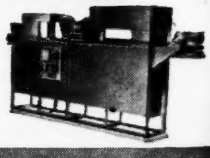
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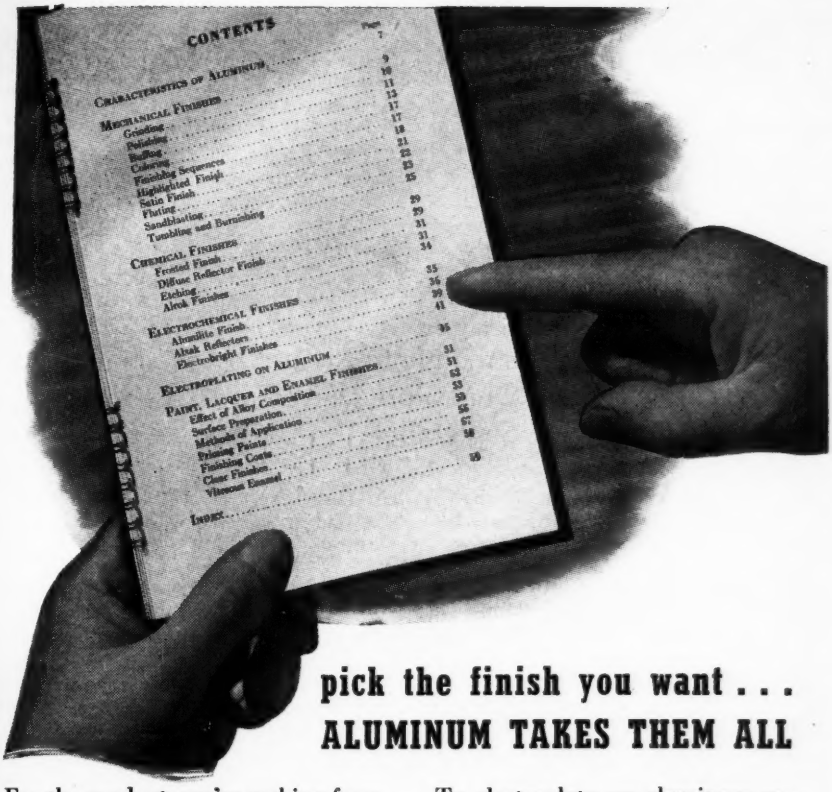

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How to Choose the Correct Type of Porcelain Enamel for Specific Applications

A Paper Presented at the Ninth Annual Porcelain Enamel Institute Forum, Ohio State University, Columbus, Ohio, September 10-12, 1947

By J. E. HANSEN
Ferro Enamel Corporation

SINCE there are literally hundreds of porcelain enamel formulations used commercially and since small variations in composition often markedly change the properties of the frit, it should be easily understood that no one enamel can ideally be suited to all conditions or for all domestic or industrial purposes. Just as an automotive engineer specifies low carbon steel for one part of an automobile, alloy steel for another part, and aluminum or bronze for still other parts, in order to provide the longest life and greatest efficiency under the service conditions to be met, so also should the porcelain enamel engineer choose and specify a type of vitreous coating to afford long life, greatest efficiency and lasting appearance to the base metal on which it is applied.

Porcelain enamel was initially chosen as a "finish" by manufacturers of plumbing fixtures, kitchen utensils, and home appliances primarily because of its ability to protect metal from rusting, but also because it produced an attractive surface which was easily cleaned. Those of us with gray hair or little hair remember the kitchen range of black and sometimes rusting iron, decorated with nickel plating. Within our own span of years in the industry we have seen this home appliance improved in appearance, starting with two or three enameled panels until now the majority are fully finished in porcelain, both inside and outside. We have seen the washing machine pass from all wood or wood and galvanized iron construction through copper and aluminum to porcelain-on-steel; we have seen similar development with refrigerators and other household appliances.

With this wider use of porcelain enamel, finishes which provide good appearance only are no longer sufficient; many service conditions require resistance to acids, and others to mild or even strong alkalies; some require resistance to boiling water and others to the action of freezing water. All of this gives emphasis to the statement that choice of the correct type of porcelain enamel should be governed by

NOTES OF A BEAUTIFUL FINISH

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the particular service condition which is to be met.

Specifications

Federal, state and country agencies often specify properties of materials which they purchase in terms of chemical analysis and other physical properties. Such specifications are worthless or meaningless in the case of porcelain enamel for several reasons: the various manufacturers do not make public the basis formulation of their products; the products are difficult to analyze accurately; and lastly, regardless of chemical composition of the enamel, the final properties of the finish depend as much or more upon the processing during the enameling operation as upon composition of the frit.

Specifications for porcelain enamel therefore are never on a basis of formulation, but are drawn up on a basis of appearance, freedom from significant imperfections and upon a basis of the service condition to be encountered. Resistance to acid attacks, resistance to specified corrosion attacks, resistance to impact and other conditions may be described; minimum and maximum thickness may be specified if this is important on the finished product.

The Porcelain Enamel Institute has developed and approved certain tests covering the physical properties of enamels; many of these same tests have been approved and adopted by the Enamel Division of the American Ceramic Society.

The Enameled Utensil Manufacturers Council (an association of kitchenware manufacturers) has arrived at **minimum** standards of acid resistance and solubility of enamels for kitchenware, and has devised methods of testing. These specifications have been promulgated by the U. S. National Bureau of Standards as Commercial Standard CS 1100-44 (Sept. 25, 1944). There are likewise available commercial stan-

DATA: Easily reversible to R.H. or L.H.; 5" side adjustment on Needle Bearings with Remote Control; Hydraulic Shock Absorber lowers weight slowly; easily tracks ¾" to 6" belts from Remote Control; Large Bearings Mounted in Arm for Lower Bearing Speeds, sealed for life with Non-Friction Grease Seals; Large Belt Length Adjustment; Counter Weighted for Steady Accurate Pressures.

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dards covering the manufacture of porcelain enameled hot water storage tanks, viz., U. S. Bureau of Standards Commercial Standard CS 115-44 (Feb. 29, 1944).

Reflectance values, as measured on some particular instrument, may be specified for white enamels, or for light reflectors, but "color" remains difficult to specify except by reference to a master sample.

Dry Process Vs. Wet Process Enamels

Occasionally a choice must be made between dry process and wet process enamels. In general, only cast iron is enameled by the dry process; the exceptions would be certain pieces of heavy steel chemical apparatus, and, at the other extreme, copper watch dials and jewelry. However, not all cast iron is coated by the dry process; small and medium weight castings are coated by the wet process. This is particularly true in the heating stove field.

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Heavy parts, such as cast iron sanitary ware, are ordinarily porcelain enameled by the dry process. Castings of the chemical analysis used in sanitary ware foundries and molded by their practice are enameled with less loss by the dry process than by the wet method, and economy in heating is obtained by never allowing the castings to cool to room temperature between successive coats of the enamel.

Oftentimes castings which can be quite successfully enameled by the dry process cannot be enameled by the wet method, due to blisters which occur each time the casting is heated; in the dry process the blisters can be punctured, and the area redusted, and good results obtained.

Dry process enamels are of both the leadless as well as lead-bearing type, and may be either non-acid-resisting or acid-resisting, depending upon service requirements.

Wet Process Sheet Iron Enamels

In most cases, a porcelain enamel finish consists of a ground coat plus one or more cover coats, the latter being of a composition different than that of the composition. If two cover coats are applied, they may be of the same or different composition. Each coat requires a firing operation before application of the next coat, except as noted following.

Occasionally a ground coat enamel, after drying and before firing, will be given an overspray of another enamel of a compatible type, and both the base coat plus the **overspray** are fired as one coat. Similarly, a basic cover coat enamel may for some end uses, either while wet or after drying, be given an **overspray** of enamel of different type, and both the base enamel and the overspray fired as one coat. Only rarely, to date, is an enamel of the cover coat type applied directly on the base metal; whenever types of frit and of base metal are required.

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Fluoboric Acid
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Nitric Acid
Potash Alum
Potassium Cyanide
Sodium Fluoride
Sodium Metasilicate
Stannous Chloride
Sulfuric Acid
Tetrasodium Pyrophosphate
Trisodium Phosphate

Rimming Steel Manufacture
Sodium Fluoride

Steel Manufacture
Sodium Bisulfite, Anhydrous
Sodium Sulfite, Anhydrous
Sulfur
Iron Sulfide

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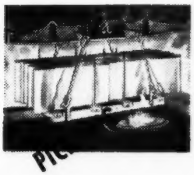
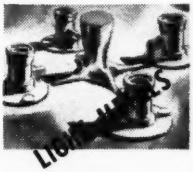


Acetic Acid
Hydrofluoric Acid
Muriatic Acid (Hydrochloric)
Nitric Acid
Sulfuric Acid
Nitre Cake
Sodium Fluoride
Sodium Bifluoride



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Sulfuric Acid
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Hydrofluoric Acid
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Sulfuric Acid

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Ground coat enamels are occasionally used as a "finish"—on parts where appearance is secondary and where protection against rusting is the primary consideration. For some such applications, "oversprays" are beneficial, as will be discussed later.

Function of Ground Coat

The primary function of a ground coat for multiple-coat work is (a) to provide adherence and (b) to prevent reactions between the metal base and the cover coat of a type which probably would result in surface defects. Composition of the ground coat may affect reboiling tendencies in the cover coat fire, copperheading, fishscaling, blistering, hairlining in the cover coat fire, sagging of cover coats, chipping on radii, thermal shock resistance, and other physical properties.

Function of Cover Coat

The function of the cover coat enamel is (a) to provide the appearance needed for successful merchandizing results, (b) to provide protection against corrosion, and (c) to protect against abrasion, physical forces, and provide a sanitary finish. The problems involved in attempting to apply "glass" to a metal base often require a compromise between workability and the optimum in the physical properties or appearance of the coating.

Selection of Ground Coat

Above all, a ground coat has to have "workability" in the enamel shop; that includes freedom from processing troubles and its behavior in subsequent firings. Consequently, the choice of ground coat frits in any plant is made with a view to obtaining this workability and freedom from defects in the finished ware.

Occasionally single frit ground coats are used, but in modern commercial practice, blends of two or more frits

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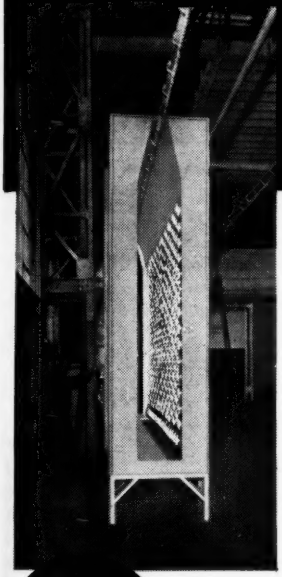

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are almost universal. Thus to a "base frit" we may add a quantity of a second frit to both decrease the fusion point and increase the adherence, and then may also add some of a third frit to provide against copperheads.

Messrs. H. D. Carter, B. W. King and H. C. Draker in a recent series of articles in "Finish" magazine conclude[1] that "the use of a properly blended ground coat appears advantageous in regard to workability as well as resistance to both thermal shock and impact resistance." They further state "choice of ground coats should not be difficult in that a wide range of conditions can be covered by properly blending different frits having satisfactory properties." With these statements, your present author agrees.

Coefficient of expansion is a guide to some physical properties of enamel finishes but it should not be used as an absolute criterion of acceptability of the enamel. If you smelt your own frit and know its composition, you can calculate the theoretical coefficient of expansion. If you purchase frit, your supplier will no doubt be glad to furnish either the calculated or the actual measured coefficient for frits where this property is important in the end results.

Thermal Shock Resistance

For best thermal shock resistance (resistance to rapid thermal change), as on kitchen utensils and electric roaster parts, a ground coat of high coefficient of expansion should be chosen. However, physical structure also affects resistance to thermal shock and kitchenware manufacturers should rely on carefully conducted tests in the selection of frits.

Impact Resistance

The resistance to impact does not seem to be affected by the coefficient of expansion of either the ground coat or the cover coat enamel.

Adherence

Adherence of the ground coat enamel to the underlying metal is usually a characteristic of the particular ground coat used, the steel base, the pickling treatment, and the firing treatment.

Chipping on Radii

To resist chipping on small radii or on beads of ware, a ground coat of high coefficient of expansion should be chosen.

Hairline Resistance

Hairlines are caused by a break in the enamel coating during the cover coat fire, and result from a condition of strain on heating established within the piece. Coefficient or expansion of the ground coat or other possible variation of the physical properties of individual enamels has only slight effect on the resistance to this breaking. A

[1] Finish, May 1947, page 52.

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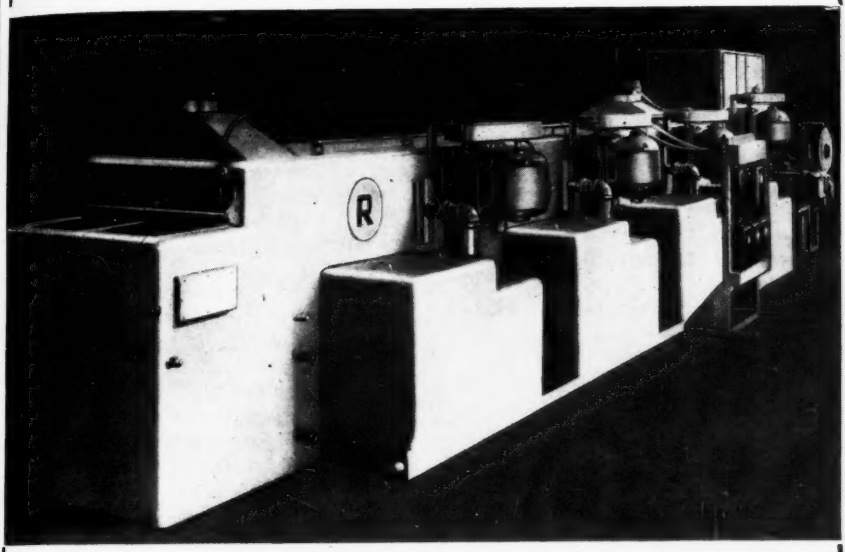

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ground coat which is too fusible with relation to the cover coat may contribute toward hairlining, as also will too heavy material application in operating practice.

After a break in the cover coat occurs, surface tension and mobility of each coating during cover coat firing and wetting or adherence between coatings during the cover coat fire materially affect hairlining.[2]

"Hard" Vs. "Soft" Ground Coat

Ground coats which fire at approximately 1600 deg. F. are usually referred to as "hard;" those which fire out well at 1550 deg. F. or lower are regarded as "soft." Many enamelers still prefer the hard ground coats and if plant layout and production procedure is such that ground coat can be run on one furnace while cover coat is fired on another furnace, there may be no good reason (except possible saving of fuel) to discontinue this type. If there is sufficient room in a one-furnace enameling department to store fired ground coat for the following cover coat shift, again there may be no good reason to use "soft" ground coat.

However, oftentimes the use of a ground coat maturing at around 1540 deg. F. will permit the firing of ground coat and cover coat at the same temperature and therefore simultaneously in the same furnace. Thus, an even flow of production can be more easily maintained.

Important also is the lower ground coat firing temperature in decreasing or even eliminating excessive distortion or warping of the metal parts during firing. An example is that of a washing machine tub manufacturer who was unable to hold the bottoms of the tubs within inspection dimensional tolerances with a 1580 deg. F. ground coat, but with a 1540 deg. F. enamel, he was not only able to hold dimensions but also to reduce the gauge of metal from 18 to 20.

Many of the soft ground coats also are found to provide better results on non-enameling grades of steel than on the older hard ground coats.

Selection of Cover Coats

Cover coat enamels should definitely be chosen on a basis of the service to be rendered by the finished ware. The choice can be made not only from clear frits but from colored frits (blue, black, and occasionally green or brown) or from white frits. Among the latter, the choice may be made from the antimony-opacified frits, the zircon-base type, or the titania-opacified variety. The choice may also be governed by requiring finishes resistant to (a) acids, (b) alkali, (c) general at-

[2] E. E. Bryant — Technical Bulletin No. 6 (1940) Ferro Enamel Corporation. See also E. C. Greenstreet—"Design and Factors Affecting Hairlining"—Proceedings First Annual Porcelain Enamel Institute Forum, page 46 (1947) and B. J. Sweo — "Hairlining of Sheet Steel Enamels" — Technical Bulletin No. 5 (1940) Ferro Enamel Corporation.

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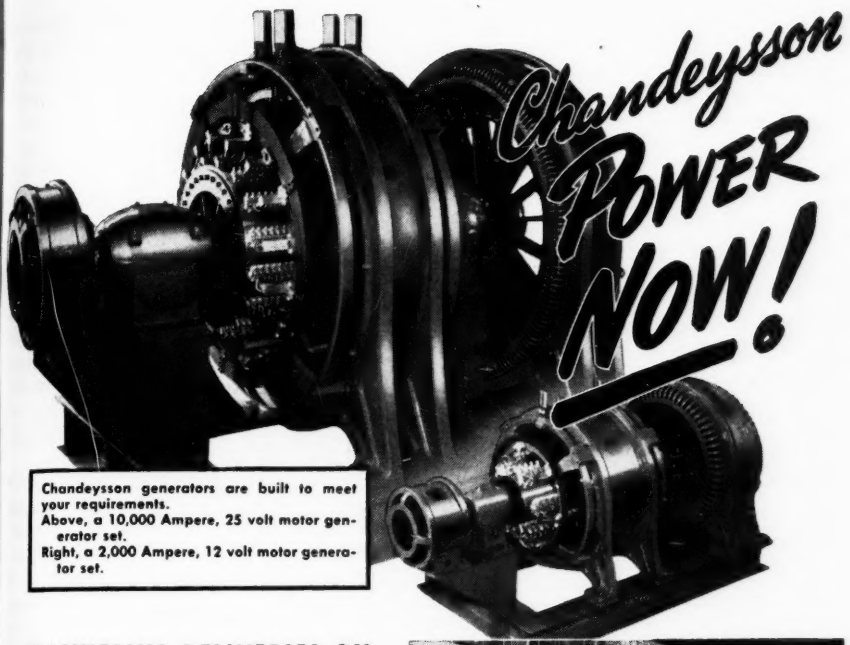

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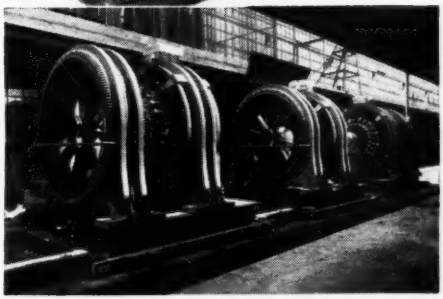

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For some purposes, the choice may be further complicated by the desire for a matte or semi-matte finish instead of the usual gloss finish. Resistance to thermal shock is required in kitchen utensil enamels and for certain heating appliances.

Antimony opacified frits have long been a standard in the enamel industry, although certain kitchen utensil manufacturers have refrained from using them because of the possibility, however remote, of antimony poisoning in foods. These frits are available in both non-acid-resisting as well as acid-resisting types.

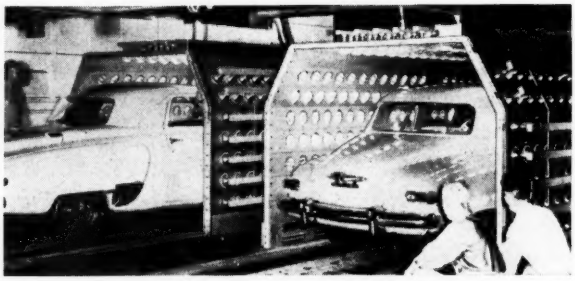
The zircon-base type frits have been widely used in the last decade and possess the advantage of greater opacity or covering power at lower weights of application compared to the antimony-opacified frits. They are not acid-resisting and definitely do not lend themselves to use on kitchen utensils.

The titania-opacified frits are a post-war development commercially, and those being widely used possess a high degree of acid resistance. This type of frit is capable of developing a high degree of reflectance or opacity at extremely low weights of application. Production of a neutral white and/or control of color is currently a problem with most producers, due to impurities in titania-containing materials and the availability (as the case may be) of these materials.

Enamels for Kitchen Utensils

Enamels for kitchen utensils should have good resistance to thermal shock, low solubility in boiling acid, and good impact resistance. Zirconia frits usually do not fulfill these requirements;

HALL Radiair INFRA-RED OVENS



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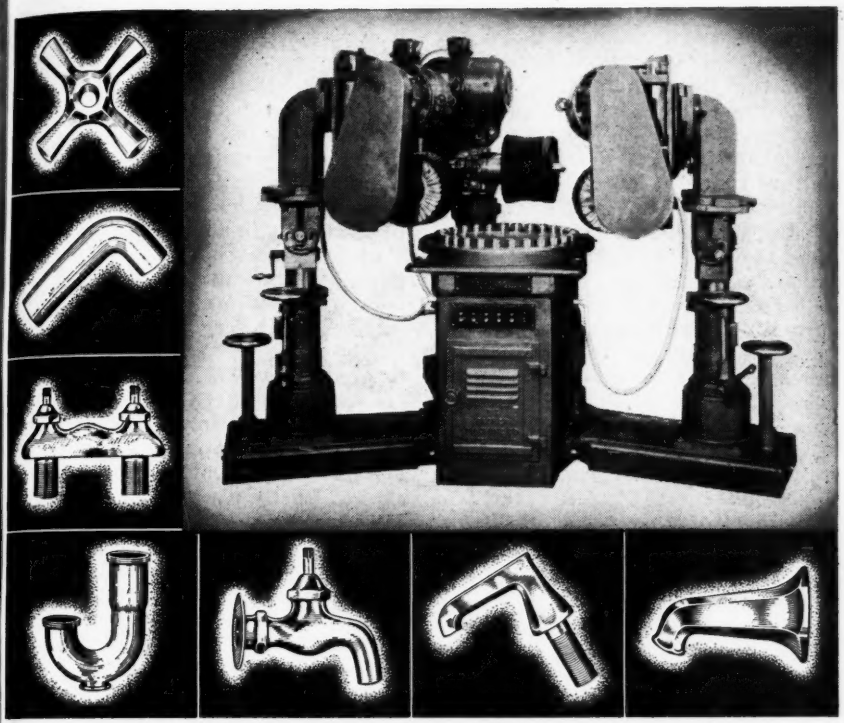

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antimony-opacified cover coat frits of low coefficient of expansion and a fair degree of acid resistance are capable of meeting the minimum requirement of the Enameled Utensil Manufacturers Council of 0.0125 gram solubility per square inch of water surface on multiple coated ware.

The titania frits provide low solubility and excellent thermal shock results, the latter because of low application weight and favorable low coefficient of expansion. Since resistance to impact depends primarily upon the thickness of coating of the enamel, and increases as the thickness increases, it follows that the thinly applied titania enamels do not excel in this respect. However, the resistance to impact is still better than that of most enamels and when damage does occur, the break is small in area.

Enamels for Gas and Electric Ranges

Porcelain enamel is used as the finish for gas and electric ranges because it is pleasing in appearance to the homemaker, and because it is sanitary and easily cleaned. For many years, ordinary non-acid-resisting enamels were used on all surfaces because of the greater workability and superior covering power. However, most leading manufacturers now finish at least the stove top in acid-resisting enamel. This eliminates complaints from the customer whose stewed tomatoes accidentally boiled over, or who thoughtlessly placed a fruit juice coated spoon on the stove top during jelly making or preserving season. The finish may consist of a full coat of acid-resisting enamel, or an "overspray" may be used over an undercoating of opaque non-acid-resisting enamel. The finish should rate at least Class A according to the Porcelain Enamel Institute acid resistance test; Class AA is preferred.

With the improved workability of the titania-type acid-resisting enamels and their superior covering power, a few manufacturers are now finishing all white exterior parts of their ranges with acid-resisting enamels. From the standpoint of giving the customer a better product, this practice is to be recommended, but limitations on the amount of titania enamel available and difficulties in controlling color have prevented wider adoption of the practice. As these limitations are overcome, the use will no doubt be extended.

Pans or shields surrounding gas burners are often finished in dark ground coat which has been oversprayed on the face side with black enamel to improve the appearance. While such practice is apparently satisfactory, acid-resisting ground coat can be used and is recommended.

The pans underneath electric heating elements are also enameled by some manufacturers. Acid resisting enamel of at least a moderate resistance to thermal shock is recommended for this purpose.

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is ideal for finishing metal products wherever brilliant lustre, permanence, toughness and stain-resistance are desired—refrigerator interiors, electrical appliances, metal cabinets, display signs, wall tile, fire extinguishers, food handling equipment, photographic equipment, aluminum sinks, hot water heaters, washing machines, tubs and various parts.

This *really new* finish is based on a new organic resin development. It is far superior to any urea and melamine modified alkyd enamel on the market. Thus it fills a real need for an economical finish with properties approaching porcelain.

In laboratory tests Duranite-H is not affected by acetic, citric, oleic or lactic acids; — nor by vegetable, animal or petroleum greases. It shows no signs of failure after 2208 hours in 3% Gold Dust at 120° F.;—after 3096 hours in 100% humidity at 120° F.;—after 1250 hours in 20% salt spray test at 95° F. In the pencil hardness test this enamel was rated 5H to 6H.

For application on steel, a Duranite-H primer gives maximum adhesion, flexibility and impact resistance. One coat on aluminum, after special preparation, gives exceptionally fine qualities. Duranite-H on surface-treated magnesium also gives a superior finish.

Now formulated for spraying, variations permit dipping or roller-coating. Required reduction is three parts Duranite-H to one part xylol. Recommended baking schedule is 30 minutes at 420° F.

Write, wire or phone for quick service and a demonstration of Duranite-H White Enamels (colors to be introduced soon). Zapon Division, Atlas Powder Company, New York City, Stamford, Conn., and North Chicago, Illinois.

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zapon production finishes

Oven linings are commonly enameled in stippled ground coat only to protect against rusting, and such practice has been regarded as satisfactory.

Enamels for Resistance to Crazing

Crazing (or bona fide cracks in the finish, as distinguished from hairlines or tearing) is basically the result of a coefficient of expansion of the enamel which is too high. It may be accelerated or aggravated by cyclic thermal changes which eventually cause a physical breakdown or a crack or a series of cracks in the area subjected to the greatest strain.

An example is the crazing which occasionally is encountered on cast iron stove parts on areas near the fire box. Crazing occasionally is also a problem on formed metal tops for electric ranges on areas surrounding the heating units. To resist or eliminate crazing, a cover coat enamel of low coefficient of expansion is recommended; however, if the expansion coefficient is too low, chipping on the radii of flanges surrounding the heating unit holes may result, so a compromise is necessary.

Enamels for Refrigerator Exteriors

Enamels for the exteriors of either domestic or commercial refrigerator cases are ordinarily of the opaque non-acid - resisting type, and have been found to be commercially satisfactory. There undoubtedly will be exploitation of the titania-type acid-resisting enamels on these appliances and fixtures because of the inherent advantages of the thinner application weights possible and the added advantage of acid resistance.

Enamels for Refrigerator Interiors

Refrigerator interiors are usually coated with non-acid-resisting enamel, except on the bottom horizontal surface, where acid resistance is desirable to protect against accidentally spilled sour milk or acid fruit and vegetable juices. Vegetable storage or hydrator pans should be finished in acid-resisting enamel to protect against juices from acidic fruits or vegetables.

Porcelain enamel is also used on surfaces where repeated freezing and thawing of moisture or condensate is encountered, as on the evaporator or freezing unit. A few instances have been known where moisture penetrated into microscopic pinholes or bubbles in the enamel surface, and the expansion forces caused by the freezing of the moisture resulted in a localized spalling or disintegration of the enamel surrounding the area. On each defrosting cycle, more moisture accumulated in the spot, and each freezing cycle produced additional erosion until the surface became badly pitted. Production of this type of defect can be accelerated by using enamels of an exaggerated "bubble structure" and can be eliminated in an enamel of minimum bubble structure.

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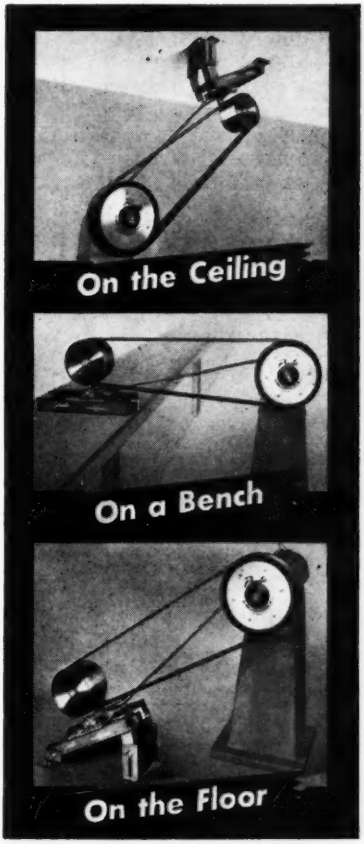

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The use of titania-bearing acid resisting enamel will apparently withstand the condition in commercial service. It is therefore recommended that enameled refrigerator evaporators, "Deepfreeze" units, or other surfaces where condensate forms and freezes be finished in enamels of minimum bubble-structure characteristics. It follows that any mill addition of bubble-structure-forming characteristics are likewise to be avoided.

Enamels for Washing Machines

Porcelain enamel finishes on washing machine tubs and component parts of automatic washers are subjected to the action of hot water, of soap, and of alkaline washing compounds such as trisodium phosphate, tetrasodium pyrophosphate, Calgon, borax, sal soda, and occasionally even lye. When we remember that boiling solutions of lye or caustic soda are used as de-enameling agents, it is not remarkable that even dilute alkalies at the temperatures used for household laundry work will attack some types of enamel severely. So far as the author is aware, no porcelain enamel has ever been developed which is completely resistant to hot strong alkalies. However, enamels are available which possess a fair degree of alkali resistance.

Washing machine parts certainly should be finished in enamels possessing reasonable alkali resistance; most of the white cover coat enamels used for the purpose have been satisfactory. Parts not finished in white, such as the "spinner" on the automatic washer still need an alkali resistant coating. The usual ground coat enamel, particularly if it is of the "soft" type, is **not** satisfactory as the finish. It is recommended that either an overspray enamel of demonstrated alkali resisting properties be used over the usual commercial ground coat, or that a special ground coat of demonstrated alkali

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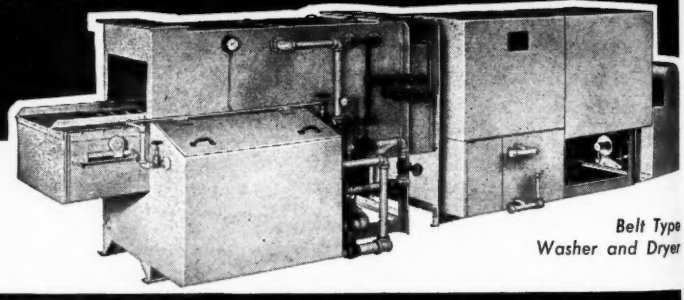

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resisting properties be employed.

Certain hidden surfaces on automatic washing machines which are left in ground coat finish only are also exposed to the solvent action of the alkaline laundry water. I leave it to the laundry equipment engineers as to whether it is important to provide greater corrosion protection on these parts.

As yet, no standard test has been devised by enamelers to measure "alkali resistance," or any standards set up as to what constitutes good or acceptable alkali resistance. One test used, recently described in "The Enamelist,"[3] is a modification of a test used to determine acid resistance[4] in which a boiling 5 per cent solution of tetrasodium pyrophosphate is used as the alkali test agent.

[3] An Alkali-Resistance Test for Porcelain Enamels, by E. Skillicorn and J. E. Hansen — The Enamelist, July 1947, pages 16-20.

[4] A Controlled Boiling Acid Test for Porcelain Enamels, by E. E. Bryant, Journal of The American Ceramic Society, Vol. 20, October 1937, page 317. Also—U. S. Bureau of Standards Commercial Standard CS 100-44, October 25, 1944.

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Enamels for Table Tops

Enamels for table tops and "breakfast sets" should be acid resisting. This includes any stencil or silk screen designs used for decoration. Table top enamels should also possess a reasonable degree of resistance to abrasion and scratching. Most acid-resisting enamels inherently have this resistance, but the use of mill addition materials which cause excessive bubble structure is to be avoided; this applies particularly to opacifiers which result in gas-opification and to clays which contain large amounts of gas-forming organic material.

The titania - bearing enamels are abrasion resistant and have found wide acceptance as table top finishes.

Enamels for Plumbing Ware

The same remarks apply for sinks, bath tubs, and lavatory basins as for table top enamels; the finishes should be acid-resistant and resistant to abrasion. The degree of acid resistance should be not less than PEI Class A, preferably Class AA. Again the titania type enamels fulfill the requirements.

Enamels for Signs

Advertising, store identification, and street signs finished in porcelain enamel are often guaranteed for ten years. It therefore is obvious that the enamels used should be "weather-resistant." Use only those frits which have been demonstrated to be resistant to general atmospheric conditions. For signs in industrial manufacturing districts, enamels of at least semi-acid resistance (PEI Class B or better) may be required to resist attack from acid-type gases.

Enamels for Architectural Panels

Like enamels for signs, architectural enamels should be weather resistant, but since matte finishes are often

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required, the choice of frits to use is considerably narrowed. A study of the weathering resistance of vitreous enameled architectural panels was reported upon by the National Bureau of Standards in 1942.[5] The study involved 864 panels, representing 14 types of porcelain enamels, some of which it had been anticipated would not be satisfactory. At the end of the first year of exposure at four locations selected for different climatic conditions, over half of the panels showed no visible weathering effect, and in no case did weathering produce any failure of the porcelain enamel to protect the underlying metal from rusting.

The full-matte enamels were found unsuited for architectural use where appearance is important, because of fading and of difficulty in cleaning.

[5] Wm. N. Harrison and Wright G. Moore—Weather Resistance of Porcelain Enameled Iron Structural Units—Journal of Research of the National Bureau of Standards, 28, June 1942 RP 147.

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Mild fading, found on some of the non-acid-resistant colored enamels, was associated with a minute pitting of the porcelain enamel surface, probably caused by the presence of acid-forming gases in the atmosphere. The finishes of high acid resistance did not show this effect.

Weathering of the panels was found to be more pronounced at those locations where there was a relatively high concentration of combustion gases and less severe where there was a practical absence of these gases in the atmosphere. It is therefore recommended that architectural enamels should be at least semi-acid-resistant.

Enamels for Hot Water Tanks

Hot water under pressure, a condition encountered in domestic hot water storage tanks, exerts a strong solvent and destructive action upon the usual type of porcelain enamel used on domestic appliances or cooking utensils, even though the enamel be acid resistant. However, special enamels have been developed by hot water tank manufacturers and by frit manufacturing companies which have an extremely low degree of solubility, and they can be recommended as being highly satisfactory.

Commercial enameled tanks should be finished according to standards adopted by manufacturers of porcelain enameled hot water storage tanks in cooperation with the U. S. National Bureau of Standards.[6] Freedom from pinholes, blisters or thin spots in the coating is as important as using an enamel of low solubility characteristics.

Enamels for Protection Against High Temperature Corrosion

Regular ground coat enamel protects steel oven linings against rusting at operating temperatures up to 500-600 deg. F. Certain black cast iron enamels afford protection to cast iron

[6] National Bureau of Standards—Commercial Standard CS 115-44 (Feb. 29, 1944).

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On plated parts Iridite forms a long lasting, sparkling *bright* finish that *stays bright,* even after handling, storage, exposure. On all surfaces, Iridite can be used to produce a variety of colored finishes.

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Resistant to the attack of water, gasoline, and ordinary corrosive conditions, Iridite provides the ideal *final finish* for all zinc and cadmium surfaces.

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On any zinc or cadmium surface that must be painted, Iridite insures a better finishing system because the coating improves initial paint adherence, blocks corrosion *under* paint, blocks metallic soap formation *between* paint and metal.

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grates above the burners on gas ranges, although the coating may eventually partially burn off.

Enamels maturing at around 1450 deg. F. have been used to protect automobile exhaust manifolds against oxidation. Enamels for exhaust manifold systems of gasoline motors operating at high temperatures, as developed at the U. S. National Bureau of Standards, have been described by Messrs. Harrison, Moore and Richmond in the Journal of Research NBS Vol. 38, March 1947, and abstracts have appeared in trade magazines. The frits recommended are available from commercial frit manufacturers.

Porcelain Enamel for Industrial Applications

Of industrial applications for porcelain enamel, there are many. These range from coatings on chemical processing tanks through a list which includes heat interchangers, space heaters, centrifugal pumps, meter casings, insecticide pumps, oil-well pump cylinders, marine bearings, metal to glass seals, and many others where the physical properties of "glass" applied to metal can be used to advantage. Each of these uses often entails individual analysis of service conditions, and hence cannot be adequately discussed in a general paper of this type.

Conclusion

May I remind you that in case of doubt as to what type of porcelain enamel composition to use for any new or specific purpose, the services of various organizations are available in an advisory capacity. The various nationally known frit manufacturing companies are sources of information and advice. Last but not least is the Porcelain Enamel Institute. If the Institute's Secretary and Managing Director cannot personally give you an answer, he will refer your inquiry to some qualified person for comments.

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Finishing Clinic

Strippable Plastic Coating Protects Surface Finishes

MOST finishing engineers in the metalworking industry realize the importance of protecting surface finishes during manufacturing operations, and are aware of what a costly matter it is to bring a marred surface back to the required finish. By applying recently developed strippable plastic coatings to metal surfaces it is possible to protect surface finishes during many types of manufacturing operations. Substantial savings in the cost of finishing deep drawn stainless steel parts have been reported by a number of stamping plants through the use of a strippable plastic coating which remains on the sheet during the fabricating operations. This is only one of several applications that have been developed, since several types of strippable plastic coatings are available and have been successfully used in protecting polished surfaces before forming and also during such fabricating operations as machining, punching, welding, and selective finishing.

Although the significant characteristics of strippable plastic coating material have not yet been fully evaluated, it has already established itself as an excellent medium for the protection of sheets in handling, shipping, storage, and especially during fabrication operations, mild as well as severe ones. One particular application in which plastic coated sheet has been used is in the deep drawing of stainless steel sink bowls. In this drawing operation, it has been found to eliminate scratching 100 per cent, thus eliminating the need for hand finishing or pol-

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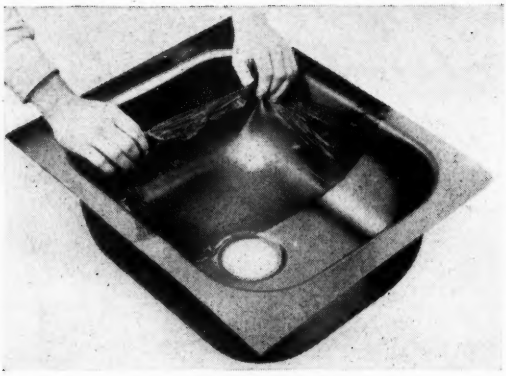


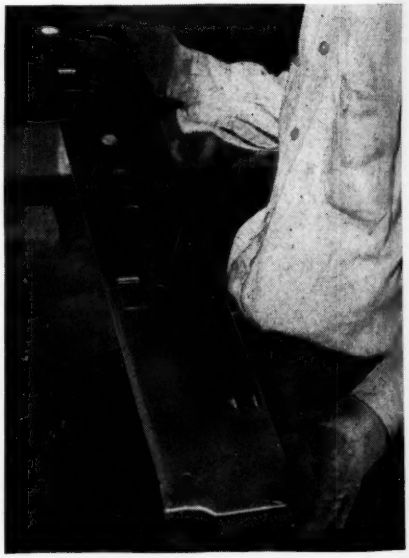
Fig. 1—Stainless steel sink bowl which was pressed with a strippable plastic film on its surface to protect the finish
(Photo courtesy Better Finishes and Coatings, Inc.)

ishing. The strippable envelope does not peel or break in the draw, and it was reported that it came from the press as though it was an integral part of the bowl. Thus, there was no opportunity for the drawing operation to mar the original natural beauty of the polished stainless steel sheet. Shown in Fig. 1 is a typical sink bowl which was drawn from stainless sheets coated with strippable plastic film.

The advantages of strippable plastic coating are limited to deep drawn stainless parts. Figure 2 shows a cooking range part, which is an example of a moderate forming operation. In this operation the coating is used to prevent scratching and marring of the high surface polish on the original stainless sheet. The coating is stripped off only when the unit is fully assembled and ready for packaging and crating for shipment. The solvent applied plastic coatings may be applied by the roller coat, spray, dip, or brush method. When welding is necessary in the fabrication set-up, the coating is stripped from the weld area, the welding operation performed, and the coating reapplied by spraying or brushing. It has been reported that the most effective coating thickness, taking into consideration the demands of deep drawing operations, is from 0.0015 to 0.0025 inch.

A number of manufacturers supply strippable plastic coatings that are used in metalworking shops to prevent scratching and blemishing of surfaces during forming operations such as pressing, cupping, or drawing. Because of the ease of application of such coatings by spraying, as well as their high film strength and elasticity, the solvent and water dispersion types of strippable coatings are highly suitable in the metal processing field for protecting surface finishes during hand-

Fig. 2—Cooking range part to which a strippable plastic coating has been applied to prevent scratching and marring of the high surface polish on the original stainless steel during forming
(Photo courtesy Better Finishes and Coatings, Inc.)



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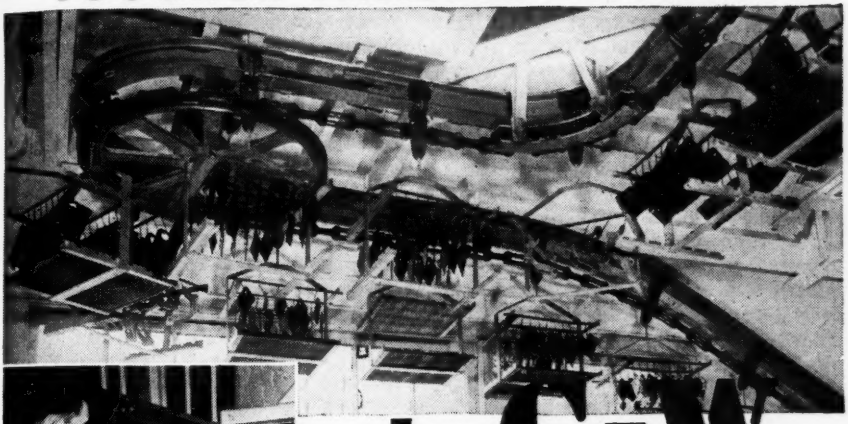

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ling and fabricating operations. Hot melt coatings, which are applied by dipping the objects to be coated into the molten plastic compound, are other types of strippable coatings, the use of which is generally confined to packaging operations (see also "Materials and Methods," July 1947).

Whether a strippable plastic coating can be used to advantage in any particular application depends largely on whether the resultant savings in lower processing and finishing costs are sufficient to justify the cost of the material plus the cost of applying it and removing it. The protection afforded by the strippable plastic coats has been found, in some instances, to produce finishes after metal fabrication which are highly attractive.

An important use of the solvent and water dispersion type coatings is as a masking material during the painting of metal products. They are also reported to be excellent for coating paint spray booths. Thus, after excess paint has accumulated, the coating with its deposit of paint can be easily stripped off. One unique application has been reported in which strippable plastic type coatings are used to protect portions of metal parts during sandblasting. The material has also been found useful as an anti-spatter medium during certain welding operations. However, the use of strippable plastic coatings as a tough, resilient material to prevent scratching of polished metal surfaces during fabrication and handling may effect considerable savings in extra finishing costs when working with highly polished surfaces.

* * *

Testing Surface Preparation

GENERALLY speaking, contaminants on metal surfaces may be

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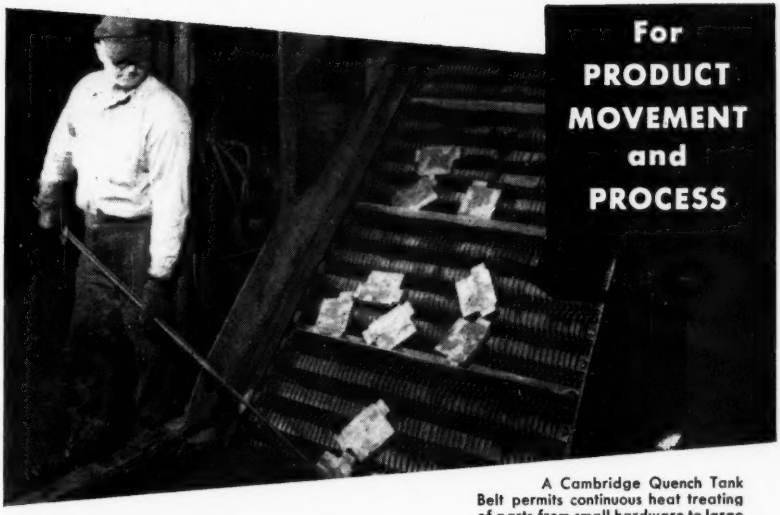

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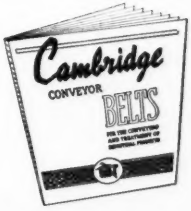

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termed visible and invisible. Visible contaminants, such as grease, oil, and dirt, sometimes cause much less trouble than invisible contaminants like alkalis, acids, salts, and hand marks for they usually cannot be detected by appearance and when present underneath an organic coating accelerate corrosion and promote blistering of the paint film.

It is certainly true that many cleaning procedures will provide metal with a surface that is clean in appearance and yet will not be satisfactory for painting. Any cleaning procedure in which the final water rinse contains small amounts of alkali or soluble salts will leave an invisible and active residue film on the surface of the article rinsed therein which is apt to cause premature failure of the paint. One method that has been recommended to protect against alkali in the rinse water is to maintain the solution at a pH below 5 with a mixture of chromic acid and phosphoric acids (see also Proc. Am. Electroplaters' Society, 1946).

One question that may arise in the mind of many metal finishers is how to determine which surface preparation methods are satisfactory. The visible types of surface contamination, such as rust, grease, oil, and dirt, can usually be detected by examining the ware, or, in some cases, the contamination may be visible after application of the finish. However, the detrimental water soluble chemical contamination generally is invisible to the eye and generally does not exhibit itself by defects in the freshly painted surfaces.

A simple procedure that has been suggested for determining if harmful water soluble contamination is on the metal surface is to immerse a sample of the finished ware in water maintained at 90 to 110 deg. F. for 24 to 48 hours, or, as an alternate, subject the finished ware for the same time to a relative humidity of 100 per cent at 90 to 110 deg. F. under conditions that promote continuous sweating. After either exposure, the film should be examined for blister formation or abnormal loss of adherence. Excessive blistering or noticeable loss of adhesion indicates an unsatisfactory degree of chemical cleanliness. If no failures occur, there is a reasonable indication that the surface was fairly free from the water soluble type of contamination, and failure of the finish should not occur from this cause.

* * *

Selection and Application of Primer Important in Finishing Aluminum

THE value of any organic coating system for aluminum depends to a large extent on the selection of the proper primer. Some requisites that can be cited for a good primer for aluminum are that it should have good adhesion to the base metal; should

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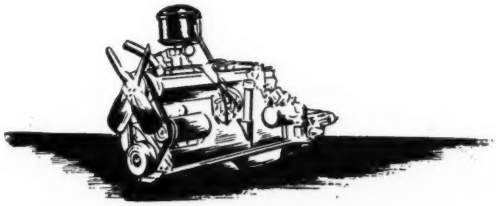

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have good resistance to moisture penetration; should possess flexibility; should possess good corrosion inhibiting properties; and should provide a satisfactory base for the top coats. Thus, not all metal primers may have the characteristics required of a good aluminum primer.

According to the recommendations of the Aluminum Company of America, of the various commercial primer pigments that have been used for aluminum, zinc chromate appears to possess the most pronounced corrosion-inhibitive properties. The primer should contain a substantial proportion of zinc chromate to be most effective; namely, at least two-thirds of the pigment content. Primers of this type are commercially available and have been widely used.

The use of lead pigments in priming aluminum should be avoided. Once the primer is properly applied, almost any durable exterior paint or enamel may be employed for the finishing operation. In some cases, where the service condition requirements are not too severe, aluminum paint has been found to be a satisfactory primer for aluminum. It fulfills the requirement of high permeability to moisture, good adhesion to the metal, and presents sufficient "tooth" for succeeding coats.

The question is often asked in finishing any metal, "Why is it necessary to use a primer?" The answer is that it is seldom possible to build into any single coat all of the properties that are desired in a finish. Frequently, the binders or vehicles that provide the best adhesion and corrosion resistance, which are requisite qualities for a primer coat, are not the best for color retention or lasting gloss; or in some cases they may be so dark in color and have such high staining power that the colors that could be obtained in any one coat formulation would be muddy and unattractive. Thus, it can be seen that a one coat finish in the case of any metal must be a compromise between adhesion and corrosion resistance on one hand and lasting gloss with attractive permanent colors on the other. There are, of course, in metal finishing operations some cases where such a compromise will prove satisfactory. However, where a finish is to encounter, in any sense, a corrosive environment, a corrosive-inhibiting primer coat is recommended. This is particularly true for the light metal alloys of aluminum, as well as magnesium.

Zinc chromate primer formulated with zinc chromate pigment added to a phenolic and/or alkyd resin base is reported to meet the requirements for an aluminum surface primer. This primer air dries quickly, being usually dry to handle in about five minutes, which is a production advantage. Based on recommendations of the Reynolds Metals Company for finishing aluminum, parts coated with this pri-

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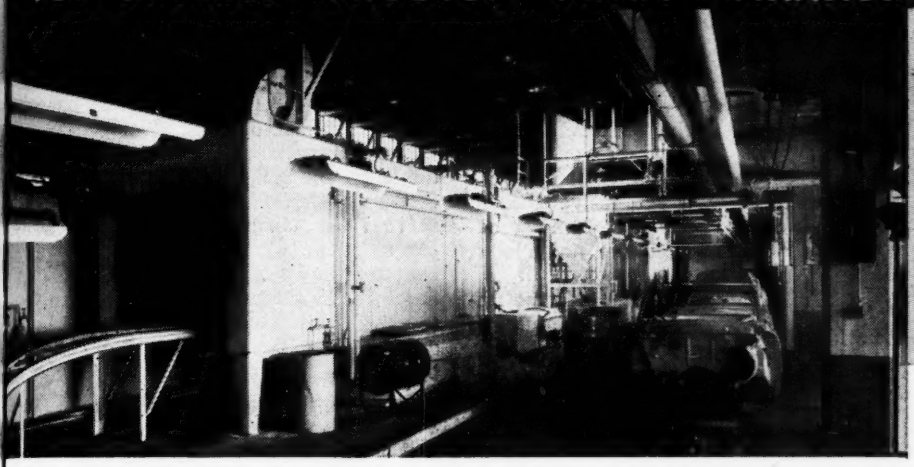

Another Complete Mahon System Installed at Studebaker to Finish New Convertible Bodies

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mer should not be left in storage for too long a period since it is reported that the paint primer film progressively polymerizes or hardens and difficulty may be experienced in obtaining good adhesion of the next coat.

In all cases, the primer selected should be compatible with the top or final finish coat and should have good adhesion to the base metal. The primers should not be softened too much or be lifted by the volatile solvents used as thinners for other types of finishes applied over them. The success of the finishing schedule is dependent, to a great degree, on the primer selected, since the primer must act in the role of an adhesive to bond itself securely to the metal and to cement firmly in place the finish coat applied over it.

The belief is prevalent in some finishing shops that primers should be applied in a very thin coat and that, if in the process of application, a few spots on the metal surface are missed completely, the top coat will cover them up and provide a satisfactory finish. In all cases, it is important that a primer film be a continuous one; as for thickness, in most cases a dry film thickness of one-half to three-quarters of a mil is considered satisfactory. In many instances of poor practice, the primer is applied carelessly, leaving spots of the surface untouched or scantily covered, because the operator thinks these will not be visible after the metal object has been completely coated.

Since the primer is the foundation of the entire finishing system, the method of application is important and deserves due consideration. In some cases, if the aluminum object being coated is of an intricate shape or if it has interior surfaces that are difficult to reach with a spray gun, it may be desirable practice to apply the primer by the dip method. Most objects can

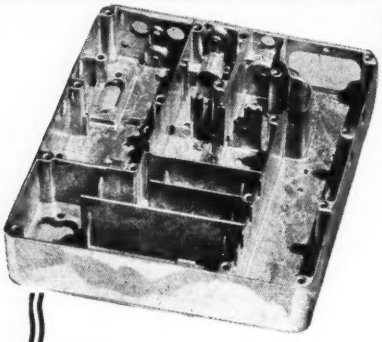

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Fig. 3—Paint spray booth for finishing aluminum
(Photo courtesy Reynolds Metals Co.)

be dipped provided they are not too large and do not contain depressions or pockets that will trap the paint. In any case, proper attention should be given to the application, as well as selection of the primer, when using it as a base coat on aluminum to assure a quality finish.

Figure 3 shows primed aluminum parts being finish coated by the spray gun method.

* * *

Barrel Nickel and Chromium Plating

TWO papers were presented at the 34th Annual Convention of the American Electroplaters' Society in Detroit dealing with recent developments in barrel plating techniques. Described in a paper on barrel nickel plating by Henry Strow, MacDermid, Inc. Waterbury, Conn., were two general types of solutions developed for barrel nickel plating. G. Dubpernell and S. M. Martin, United Chromium, Inc., presented a paper on barrel chromium plating.

In discussing solutions for barrel nickel plating, Strow stated that the high sulfate type of solution is satisfactory for general purpose work and can be used almost universally regardless of equipment. Brighteners were reported to be available which provide excellent results with good throwing power. It was also reported that parts plated in this solution could be chrome plated without difficulty. The other type of solution described contains a large amount of nickel chloride and also uses organic brighteners. Because of the corrosiveness of this type of solution with high chloride content, special equipment must be used. However, it was brought out that this solution has high conductivity, a high tolerance for impurities, and is very well suited

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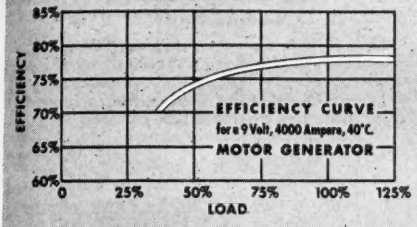

Typical Life-Time Efficiency curve of ELECTRIC PRODUCTS motor-generator

The cost of electricity may seem an insignificant part of overall plating costs . . . until you figure it on an annual basis.

Biggest determining factor in annual current cost is the operating efficiency of the generating equipment. Consider the case of a 4,000-ampere, 9-volt motor-generator that has an efficiency of only 55% and which operates 3000 hours a year at a cost of 1½ cents per kw-hr. of electricity. If the machine had an efficiency of 75%, *the User would save $765 per year.*

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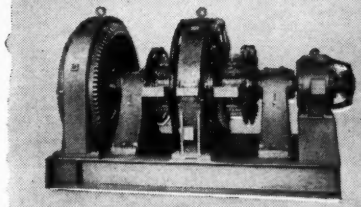

Every part of an E.P. Motor-Generator is readily reached for inspection and maintenance particularly important with relation to the bottom brushes. E.P. equipment requires no special protective equipment. Thirty-four years of operating experience prove that these Motor-Generators function safely under the extreme conditions common to most electrolytic operations.

EP X-22

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for the production of heavy plates.

The high sulfate solution described was of the Watts type with the addition of magnesium sulfate to improve the conductivity. One solution composition recommended for use with 12 volts operating potential was of the following composition:

Nickel sulfate	32 to 40 oz./gal.
Nickel chloride	8 to 10 oz./gal.
Magnesium sulfate	24 to 32 oz./gal.
Boric acid	5 oz./gal.
Temperature of operation	Approx. 130 deg. F.
pH of operation	5.2 - 5.6

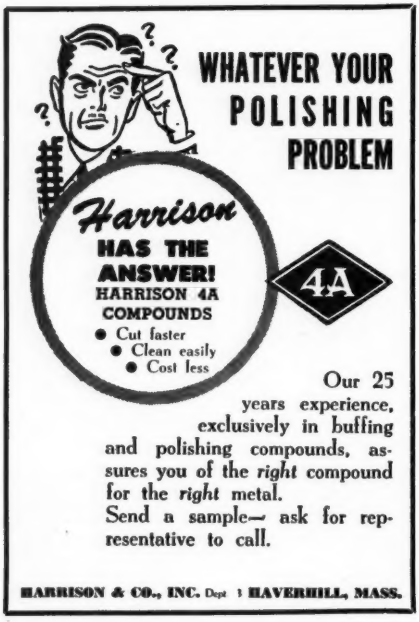
Non-metallic tank linings and heating coils are required for the high chloride type of barrel nickel solution; it was brought out by Strow that all materials used in barrel construction for use with this type of solution should be of a type approved for bright nickel plating. The conductivity of the barrel solution of the chloride type was reported to be more than twice that of the sulfate type of electrolyte and the plate, although slightly harder than that produced from the sulfate type of electrolyte, was said to be extremely adherent and not subject to peeling or flaking, even when plated to a thousandth of an inch thickness. The approximate solution formula suggested for the high chloride type of electrolyte was as follows:

Nickel sulfate	20 to 25 oz./gal.
Nickel chloride	20 to 25 oz./gal.
Boric acid	5 oz./gal.
Organic brighteners, Use as recommended	
Temperature of operation	Approx. 130 deg. F.
pH of solution	4.5 - 5.0

According to information presented by Dubpernell and Martin, barrel chromium plating as practiced today in special equipment is confined to the plating of a thin layer of work only, and the parts cannot be heaped up in a thick layer or mass or plated in large production volumes, as in barrel plating with zinc or cadmium. The distinction brought out was that barrel chromium plating is adapted or recommended for parts which cannot be otherwise chromium plated economically, if at all. Examples would be extremely small parts or parts of such shapes that would not be adapted to racking, wiring, or basket plating.

It was stated that a plating time of 10 minutes is generally used in the barrel operation which was reported to provide an average thickness of bright chromium plate of about 0.000005 to 0.00001 inch. This is about equivalent to 1 to 2-minute plating time in a still tank under the conditions commonly used for bright plating. The maximum speed for bright plating in the barrel operation was given as about 0.00001 inch per hour or perhaps a little less. It was also recommended that the work should preferably be nickel plated prior to barrel chromium plating to a minimum thickness of 0.0001 to 0.0002 inch.

Finishing engineers may be interested in investigating further these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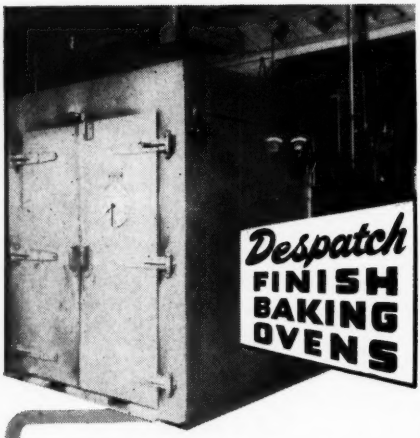

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new developments reported for the bulk handling of small parts in electroplating operations.

* * *

Chemical Treatment Improves the Corrosion Resistance of Tin Plated Steel

A process for increasing the corrosion resistance of tin plated steel, known as "Protectatin," has been developed as a result of a program of work by the Tin Research Institute. As early as 1940, the Tin Research Institute in England began development work on a practical means of producing a protective film on tin plated steel; later, Battelle Memorial Institute, in this country, assisted in the program. It is reported that the process has now been developed to a point where a thin, invisible oxide film can be produced on tin plated steel in 20 seconds or less (see also "Materials and Methods," August 1947). The process consists of simply dipping the tin plate in a hot alkaline phosphate-dichromate solution containing a suitable wetting agent. The resulting film, reportedly, protects the tin plate from sulfur staining, greatly retards rusting in moist air, and provides a good base for paint on thin electro-tinned plate. The composition of the solution recommended for use is as given below:

Constituent	Concentration g./l.	Concentration lb./100 gal.
Trisodium phosphate (crystalline)	20	24
or		
(Trisodium phosphate anhydrous)	(9)	(10.8)
Sodium dichromate	8	9.6
Sodium hydroxide	22	26.4
Wetting agent	3.0	3.5

During the filming process, the temperature of the solution should be kept as high as possible, within the range of 140 to 185 deg. F. With brush type washers it is reported that a single pass of the work through the ma-

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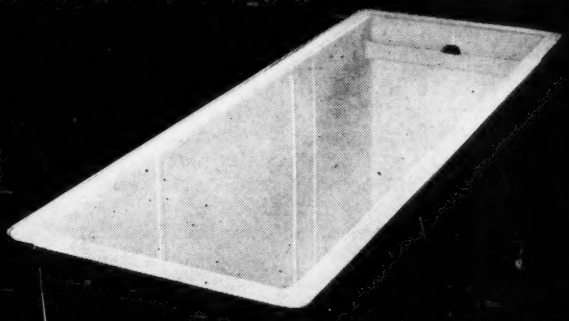

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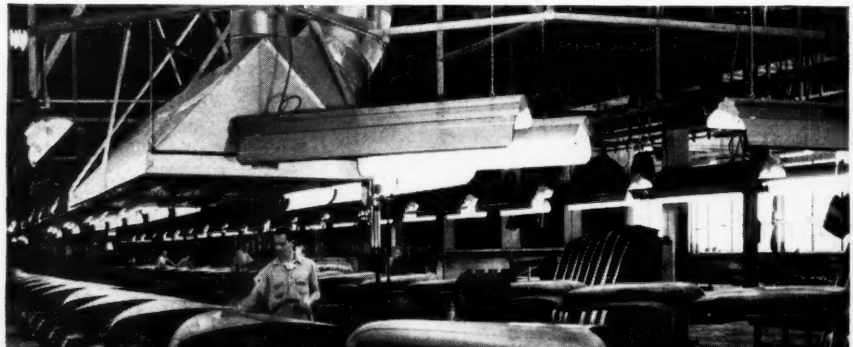
chine, requiring about 2 seconds, is sufficient. Where simple dipping is used, the immersion time should not be less than 10 seconds at 185 deg. F. to 20 seconds at 140 deg. F. The wetting agent is an important constituent of the bath, improving the detergent and wetting properties of the solution and thus allowing the filming to proceed rapidly. It has been recommended that commercially available wetting agents, such as Drysonol ME dry, Merpol B, and Tergitol 4, are said to be satisfactory for use in this alkaline solution.

In recent years, the use of tin plate on steel as an undercoat for paint has received considerable attention; thus, finishing engineers dealing with tin plated steel may wish to investigate this method for improving corrosion resistance.

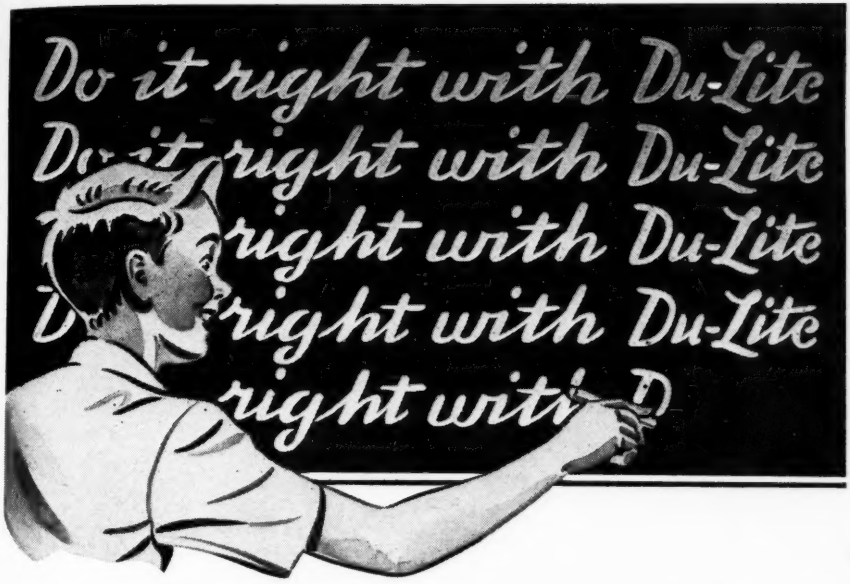
Dixie Dust Collectors. A 12-page catalog published by the Dixie Manufacturing Co., Inc., 1324 Russell St., Baltimore 30, Md., presents illustrated, descriptive, and tabular information on tubular and hood dust collectors for industry. Typical installations of the equipment are shown and discussed, with tables of helpful engineering data presented. Copy of General Catalog No. 47B free upon request.

"Grits and Grinds" Vol. 38, No. 10. This edition of the monthly house organ published by the Norton Co., Worcester 6, Mass., is devoted primarily to an illustrated article entitled "Precision Tumbling of Metal Parts" by R. M. Lord, Norton grinding engineer. Topics covered include advantages, grit sizes, untumbled abrasive, tumbled abrasive, abrasive tumbling applications, tumbling equipment, size of abrasive to use, amount of abrasive to use, cleaners and compounds, and so on.

Copy of "Grits and Grinds" Vol. 38, No. 10 free upon request.



THIS illustration provides a view of one of the "merry-go-round" assembly lines in Buick Motor Division's new sheet metal plant, showing workmen spraying hoods for Buick automobiles. Painting operations in the huge new plant require 40,000 gallons of paint-in process and storage facilities for an additional 40,000 gallons.



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Barrel Finishing of Metal Products

Part 17—First in a Series of Discussions Covering the Development of Finishing Materials Used in Barrels

By H. LEROY BEAVER
Barrel Finishing Consultant
Lansdale, Pennsylvania

IN the period of over ten years during which these series of editorial discussions covering various phases of the barrel finishing of metal products have been published, there have been very many of our readers who have asked that we devote both time and space to the tracing of the origin and development of the multitude of materials which have been used in barrels and that have some application both in the matter of removal of surface area of parts or, in lieu of that, the production of smooth or brightly burnished surfaces. With regard to such materials, we have two very early references, the first of which was suggested by Mr. Albert Pott, sales manager of The Baird Machine Company, in his citation of a brief episode from a very early, or should we say medieval, description of the manufacture of armor by early English armorers and most likely having reference to the production of either scale or chain type armor. Herein it was stated that "Ye apprentice was required to place the parts in a cask along with small jagged stone fragments, and then to roll the cask about upon the ground until all parts were smoothed." This work, no doubt, was published at a time when tilting, jousting, and such other forms of activity were much in vogue, and it is very likely that we can find what could be termed a paraphrase of this same story in another story originating in Waterbury, Conn., in the early days of this country's activity in barrel finishing wherein it was claimed that metal parts were funneled into used wine casks, sharp sand and water were added and then the casks were rolled about until the parts attained a finish somewhat akin to a later wheel process generally termed "ashing." Whether to credit these stories we hardly know, however once, mostly out of curiosity, we assumed a keg rolled over and around for a length of time equivalent to a present-day long and narrow barrel, and in that equivalent length of time we figured that such a keg could have been rolled a distance about equivalent in miles for a trip from Waterbury to Torrington and return. We rather casually mentioned this fact one evening when it was our pleasure to be the guest speak-

er before the Bridgeport Chapter of the American Electroplaters' Society, and following which it was our good friend Ray O'Connor of the Contract Plating Company, who knows Connecticut inside and out, remarked, "It could be, because there was undoubtedly plenty of hard cider available on both the outgoing and incoming route to lend courage and stamina to the cask rolling contingent."

Our second reference to early materials or processes is one suggested by our good friend George B. Hogaboom of a translation from his copy of an original Rosselieur from the French, in which it was described first that small metals or metal parts along with sharp small stones, rounded pebbles, and bits of wood were all enclosed within a goat skin bag that was rolled about until smooth surfaces were obtained on the parts. Secondly described was a later development where metal parts along with small jagged particles of minerals were enclosed in a device much like the old fashioned hand-operated peanut roaster with which we oldsters should all be familiar because most every hamlet in the country boasted one or more of them, but which would be regarded more in the light of antiques in this day. This metal drum was then turned with a hand crank until the desired finishes were obtained.

We suppose that we should now say that both of these methods, if they could be so termed, are shrouded in the mists of antiquity quite as they should be, but just to show how some of these ancient conceptions have a sort of rebirth or renaissance it has only been a few years ago that a somewhat similar peanut roaster type of burnishing barrel was actually introduced in the food service field for the maintenance barrel finishing of silverware. This unit was a small eight-sided barrel which contained steel balls and was turned with a crank for a suggest-

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ed period of twenty minutes to produce a bright luster on silver plated flatware especially.

Many readers have asked if a complete bibliography of barrel finishing could be compiled. For our own part we have searched through library after library, both technical and otherwise, as well as old files of trade papers containing articles on barrel finishing, but for the most part we have found only so-called "write-ups" wherein some gifted writer with high sounding phrases proceeds to make claims for a particular manufacturer's line that are literally "out of this world" with regard to results to be obtained from the installation and use of either materials or devices or both. Therefore, we disregarded such information and proceeded to literally start from scratch in our attempt to prepare a history of barrel finishing. The present discussion provides an explanation of data we have unearthed.

It is our conviction that nothing constructive or educational was developed in the field of barrel finishing procedure before the year 1885, just 63 years ago. We would be entirely satisfied to date the barrel finishing procedure which we now know on the foundation of the experiments that were started at about that time. Naturally, we have reference to the work and activities of Edmunds in England which from all we can learn were initiated in the year 1885. It has been next to impossible to obtain accurate information as to the sequence of the things he attempted and much of what we have must be said to be legendary. We are told that barrel finishing first excited his interest while he was watching a revolving screen at a stone crushing establishment and, noting the bright polish of the inner surfaces of the perforated screen, he reasoned that if these small crushed stone particles could be retained within a suitable revolving barrel or drum and if the metal parts were added that they too could be made to take on the same bright finish as the inner surfaces of the barrel shell. It is reported that after building a barrel he variously tried crushed stone with its jagged cutting edges, passing from this to seashore pebbles and later adding crushed shells of native bivalves which might have been oysters, clams, scallops, or whatever was available. However, it is not a matter of record that he ever realized that when he added his oyster or clam shells that this was most likely the first application of lime in one form or another in the barrel finishing process. since the lime as represented in this way is nature's own method of producing an almost pure form of calcium carbonate.

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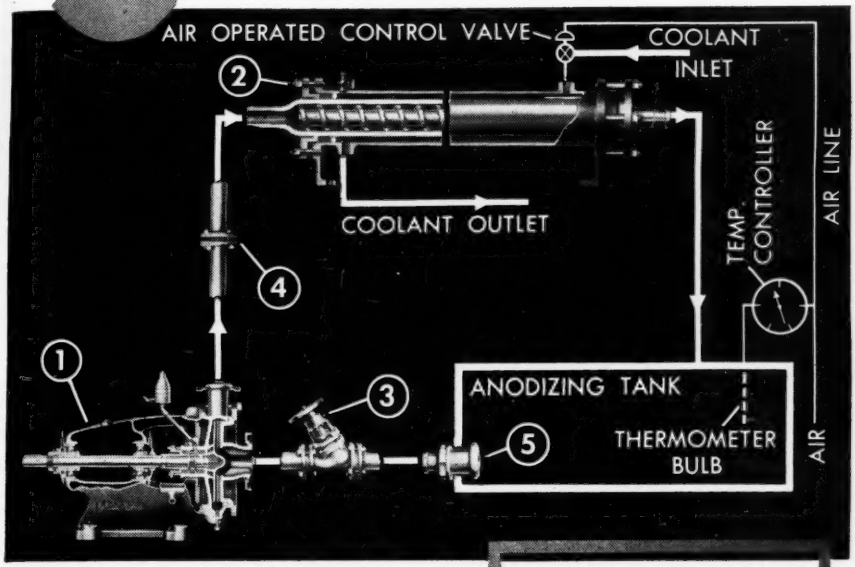

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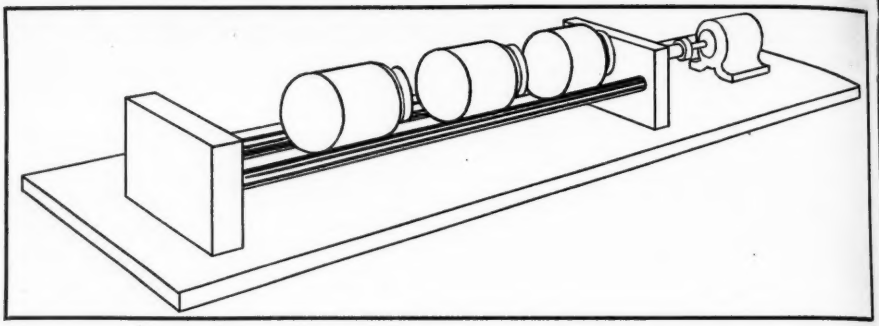

Fig. 1—Drawing of early can-type barrel finishing unit

rounded off, the rate of removal decreased rapidly and then instead of a cutting down action as we would call it today, he obtained a rubbing or smoothing operation from the jagged parts which by this time, no doubt, more nearly resembled natural pebbles than anything else. We are told that this first jagged material was derived from what was termed "pot stone," later shortened into simply "pot." This material was a form of magnesium silicate or steatite differed very materially in both structure and characteristics from the seashore pebbles which he used at a later date along with soap and water, not as a lubricant, but as a means to wash the surfaces of the parts as they were smoothed by the rubbing action of the smooth pebbles. For the most part he found that pot stone was comparatively soft or friable in nature and that it did present some interesting characteristics in that the parts would fracture and then continue to refracture, each time presenting new cutting edges to act upon the metal parts in process. He discovered that the best results were obtained with the use of particles of roughly ⅜-inch size in the initial charge which was operated until the particles completely disintegrated into almost what we would term "mud."

It is not too difficult for us to see that even at that time Edmunds must have had some conception of the factor of the number of points of contact per inch of surface area with regard to the degree of efficiency of the sizes of materials used. As to the size and shape of the barrel he used in these original experiments we do not know, but it might be safe to assume that the barrel was not unlike the Edmunds Barrels that were first imported into this country in 1901 and which were of the long and narrow type and not unlike the present-day Baird Barrel except that they were not of the end-opening type.

In tracing further the application of finishing materials used in barrels, we came upon another and quite different type of barrel. While many of the first barrels to be used were simply cylindrical shells and very often discarded sections of boilers, stacks, or other round instrumentality, these different types of barrels were an innovation over anything we had ever seen before. In their general appearance they resembled a squat type of milk can such as are used by dairies. About sixteen inches in diameter and eight inches wide, they each had a neck or end much like a milk can and were operated in what we would call gangs, as shown in Fig. 1. The can-type units were rotated by means of long shafts

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which supported a dozen or more of the units and were all driven by friction. The arrangement was such that one shaft was driven while the secondary shaft idled but helped to support the barrel or can-shaped members. Had these cans been made either six or eight-sided, as would be the present day practice, it would have been necessary to have circular bands around

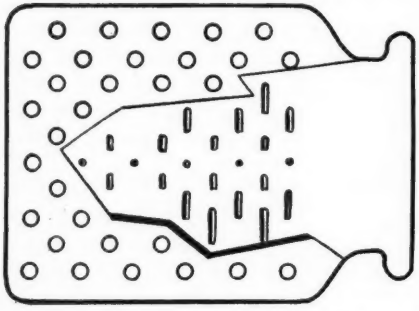

Fig. 2—Drawing of can-type barrel with periphery cut away to show pins which are inserted through the barrel to help raise the mass

the outer shells to provide an even track from which the barrels would be driven. Therefore, to compensate for this lack of "lift" in the inner structure of the barrels, the periphery of each can was punctured in a regular pattern and pins were inserted and anchored to the barrel or can shell, as shown in Fig. 2. These pins had a tendency to provide lift to the mass in operation in the barrel, as well as to keep the parts in constant motion rather than to have them simply swish back and forth in the bottom of the can as it revolved on its shafts.

We have only seen these can-type barrels in one industry. In their early history, their first use and development were attributed to the English Spencerian Pen Company where they were used to remove the burrs from writing pen blanks and then to provide a final finish or polish to the pens, as well as to round off and polish the nibs so as to provide for a smooth and even writing surface. That these barrels must do an admirable job seems to be borne out by their years of continuous use, and we wonder why they have never been adopted in some of the other manufacturing fields where small parts of light specific gravity might well be operated in much the same way as pen points. In connection with the can-type barrels we find one of the earliest applications of fragmented minerals as a finishing medium. Small particles of what was termed Scottish Pot were used but we cannot say that the material was actually of Scotch origin. However, we do know that at least one of our prominent manufacturers of pens for a long period of time imported this material for use in their barrels until they managed to find an American material that served equally as well.

Many of these experiments conducted in the eary years of barrel finishing procedure were interesting and we have at one time or another undertaken to duplicate some of them. One of these we touched upon in the discussion of September 1938 wherein we detailed the operation with crushed mica schist (granite) chips combined with crushed oyster shells for an operation in a barrel for smoothing small iron castings in preparation for painting. This was in no sense a new development since it had already been tried by Edmunds in England at least forty years before.

Much has been said and written in recent years regarding barrel finishing compounds but there is little here either that is new for compounds were used in this country in New England as long as thirty-five years ago. George E. Abbott tried out many combinations of binders and abrasives, one of which we distinctly recall as being melted cocoa butter into which he stirred as much fine emery as the solution would

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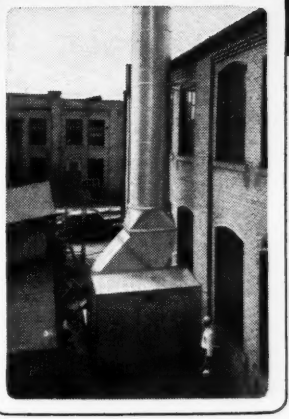

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hold and then operated in a barrel, the theory being that the melted grease, as he termed it, would hold the emery firmly to the parts he was finishing as well as the finishing material and thus provide a faster cutting action. For a finer and smoother finish he incorporated both crocus powder and rotten stone in a binder material of the same character. We are told that at one time it was a matter of common practice to shave cocoa butter from a block into the barrel, then add very hot water and caustic soda and thus actually produce a burnishing soap within the barrel while it was in operation.

We often wonder when going back through the years to these early experiments why some of our local and current "inventors" who years later stumble upon a similar idea immediately consider themselves as the very first ones to think of any such proceeding. Whereas, if they had used even a small amount of diligence they might have learned that the very thing they hoped they had discovered was in truth and in fact only the revival of what someone else had tried and in many cases abandoned many years ago.

There is something in the laws regarding patents that has to do with the thing called "anticipation." There is another phrase that is termed "the doctrine of prior use," as well as a third phrase where, if a method or material or a combination of both is discovered, tried, adopted, and no effort whatever made to obtain protection of the discovery in the form of a patent, the discovery is permitted to come under a "dedication to public use."

When you think you have discovered something new in the field of barrel finishing materials or procedure, it is advisable to delve backward through the years to learn what someone else might have and did do before you. Metallic burnishing materials, steel, balls and the like, did not come into general use in this country until about 1901, and so, on the application of non-metallic materials your search should go backward from that point. Of course you can secure a patent, but suppose you try to protect it only to find that documentary evidence is brought in showing that the identical process and materials were discovered and used and not only that, but dedicated to public use by someone else years before.

(To be continued)

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Fig. 1—At the end of the production line at The Midland Steel Products Company, unfinished automobile frames are picked up by a 1,000-foot long conveyor chain for transportation through various stages for finishing.

PICTURE OF PROGRESS

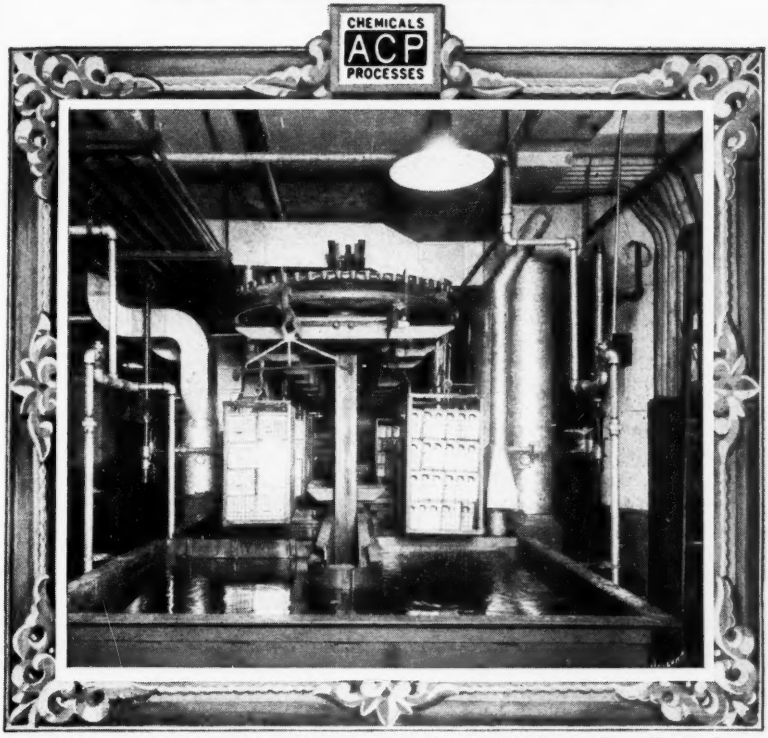

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Fig. 2 — A turntable device located at the outlet end of the paint drying oven allows for easy handling of finished automobile frames in stacking for transportation to the storage yard.

of 8,000,000 B.T.U. per hour bake on the finish. The gas-fired paint-drying oven is 18 feet wide x 28 feet high x 160 feet long, and the four direct-fired recirculating heaters provide air at a temperature of 350 deg. F. The capacity of the oven is approximately 100,000 lb. of work per hour, or 350 automobile and truck frames.

As shown in Fig. 2, a turntable device is located at the outlet end of the gas-fired paint drying oven to allow for easy handling of the finished car and truck frames in stacking for transportation to the storage yard.

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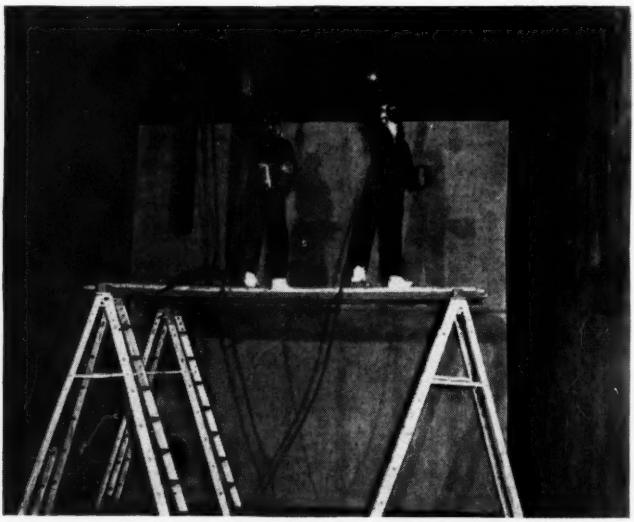
ONE of the largest jobs of lining tanks with rubber was recently completed by The B. F. Goodrich Company in the barge "Sayreville," owned by the National Lead Company and used to haul dilute sulphuric acid waste from the company's paint plant between South Amboy and Sayreville, New Jersey, and dump it into the Atlantic Ocean 10 miles off the New Jersey coast. Said to be the largest non-propelled vessel ever built, the barge has an overall length of 264 feet 3¼ inches, breadth of 43 feet, designed draft of 13 feet 8 inches, and dis-



Field workmen of The B. F. Goodrich Company installing rubber linings on one of the eight main tanks of the barge "Sayreville"

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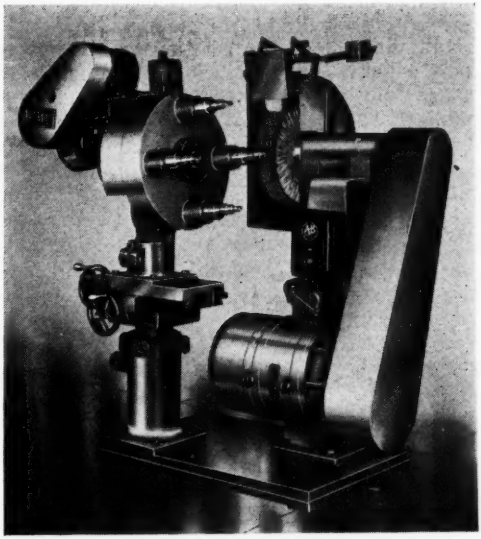

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The four slurry tanks are each 20 feet high x 12 feet in diameter with a 7-foot cone at the top and bottom, and are lined with ¼-inch rubber. The acid is loaded from shore tanks, also rubber-lined, through 10-inch rubber hose. All metal pipe and connections through which the acid passes are also rubber-lined.

Twenty tons of rubber and 1,500 gallons of cement were used to bond the rubber linings to the metal tanks of the barge.

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A 50 PER CENT reduction in production costs is said to have resulted from the installation and operation of a semi-automatic power brushing machine at Monmouth Products Company's Cleveland plant. The machine, designed jointly by Monmouth and Osborn Manufacturing Company engineers, is used for removing oil, grease, and dirt from automobile and truck clutch plates prior to their final inspection.

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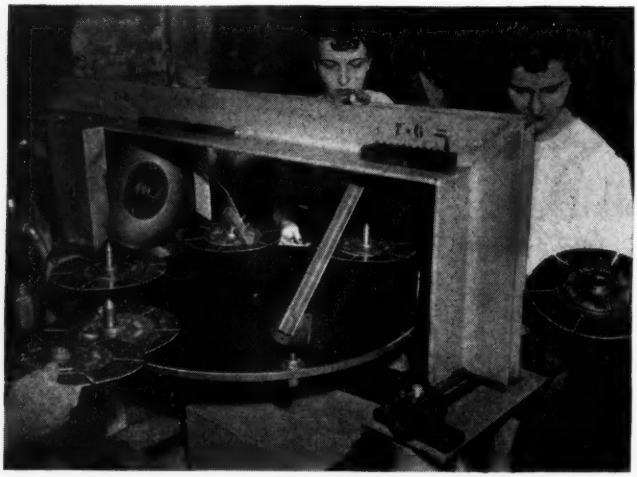
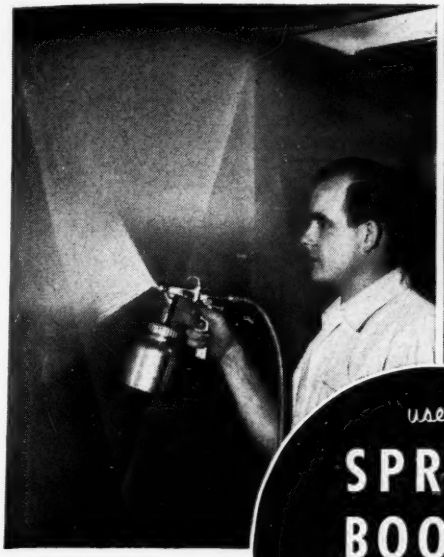


Semi-automatic power brushing machine installed at Monmouth Products Company's Cleveland plant for cleaning clutch plates prior to inspection



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- ✔ *Requires no special reducer.*
- ✔ *Needs no special equipment.*
- ✔ *Excellent coverage.*
- ✔ *Saves time . . . labor.*
- ✔ *Economical.*

Note: Specify Window Paint-Shield (Clear) for coating booth windows and light fixture openings. Does not impair lighting. Strips clean.

Ramsell Products, Inc.

DES MOINES 3, IOWA • AFFILIATED WITH PERFECTION PRODUCTS, INC., CHICAGO, ILLINOIS

action. Each set of brushes consists of four sections mounted together and forming a 2-inch brushing surface. The upper set of brushes cleans the tops of the plates while a similar four-section set immediately below cleans the bottoms of the plates. The brushes are powered by an electric motor at a speed of 1,800 r.p.m. As the brushing operation is completed, two girl operators inspect the plates and remove them from the spindles.

One of the advantages claimed for the combination spinning and brushing action afforded by the machine is that the brushes do not load up. Another brushing advantage is that while most of the grease, oil, and dirt is removed from the surface of each clutch plate, a very thin coating of oil remains to prevent corrosion.

Self-Contained Dust Collector Creates Dustless Backstand Sander-Grinder

A FIRM now engaged in the production of metal rings of the type shown in the accompanying illustration utilizes for finishing operations a standard two-wheel pedestal grinder which has been converted to a dustless backstand sander-grinder by means of a standard backstand attachment, "Dustkop" dust collector, hood, and two lengths of flexible metal hose. In the illustration, an operator is shown smoothing the slightly rough edges of the rings which have been produced by a nibbler. The equipment is also used in smoothing the edges of the welded rectangular assemblies shown. The wheel on the opposite end of the sander-grinder is used for miscellaneous tool grinding.

The standard Model 420 Dustkop dust collector employed is a product of the Aget-Detroit Co., Ann Arbor, Mich., and is entirely self-contained,

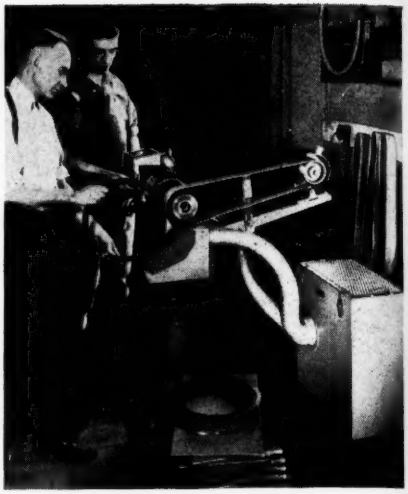

Illustration showing rough edges on a metal ring being removed by a standard two-wheel pedestal grinder which has been converted to a combination backstand sander - grinder through the use of a backstand attachment, dust collector, hood, and two lengths of flexible metal hose

having a motor-driven fan, cyclone separator, and second stage filter for the recirculation of cleaned air back to the working area to conserve heat. The sander-belt hood included in the installation is so designed that heavy chips, scale, and so on, are usually not drawn into the dust collector, yet can be easily removed from the hood. Portability of the entire outfit permits it to be moved as a complete unit to other locations in the shop as needed.

Stanwood Fabricated Metal Products. The Stanwood Corp., 4819 W. Cortland St., Chicago 39, Ill., has released a 16-page catalog illustrating and describing baskets, trays, fixtures, retorts, and carburizing boxes for efficiently handling parts through production heat treating, quenching, pickling, degreasing, rustproofing, and other processing cycles. Over 60 Stanwood-designed units are pictured in the catalog, copy of which is free by requesting Catalog No. 16.

Introducing

A NEW FAST WORKING ZINC BLACK

MARKING *Another* BLACK MAGIC *Achievement* IN THE FINISHING FIELD

DO you use zinc or zinc alloys in any form? Get the facts about Black-Magic Zinc Black. This modern treatment imparts a fine corrosion and abrasion resistant finish to zinc with simplicity and speed! Not only a highly attractive finish in itself, but an excellent bond for paint which also affords corrosion protection to unpainted areas.

Illustrated are but a few of the many thousands of applications for this useful finish. Write for details on this, also on Black-Magic finishes for all other metals. (Send us an article for sample processing.)

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MODERN METAL FINISHES
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NEW JERSEY: Lacquer Finishing Co., Inc., Clifton, N. J. C. D. Hamilton, Fayetteville, N.Y.
PHILADELPHIA: Albert Printz, Germantown CLEVELAND: Universal Paint & Varnish Co.
DETROIT: The Danell Co. MILWAUKEE: A. B. Plating Supply Co. ST. LOUIS: G. S. Robins & Co.
DALLAS, TEX.: Texokana Supply Co. LOS ANGELES: Barber-Webb Co.
OAKLAND: Geo. A. Kushman Co.

NEWS of the Industry

Receive 25-Year Service Awards

Eight representatives of the sales department of the J. B. Ford Division of Wyandotte Chemicals Corporation recently received gold watches in recognition of their 25 years of service to the company. Referring to the accompanying illustration, these representatives include: (first row, left to right) Edward J. Wiley, Springfield, Ill.; Marlin T. Large, Salt Lake City; Cary W. Lange, Grand Rapids; Elsie Wieduwilt, secretary, Philadelphia; Rose Lindemann, secretary, Wyandotte; Wilfred B. Smith, Providence; S. V. Alexander, Louisville; and Clayton C. Cameron, Detroit.

Carter B. Robinson, vice president in charge of sales for the J. B. Ford Division, was toastmaster at the 1947 Service Award Banquet and is seen in the center of the second row. On Mr. Robinson's right is E. M. Ford, president of Wyandotte Chemicals. On his left is W. F. Torrey, senior vice president. The banquet was attended by nearly 500 guests.

Glidden Varnish Modernization Program

According to an announcement made by A. D. Duncan, vice president, four major paint and varnish plants of The Glidden Company are sharing in a $1,000,000 varnish modernization program, which is expected to be completed late this year. Extensive modernization work has been undertaken at Glidden's paint factories in Cleveland, San Francisco, Reading, and Minneapolis. Each plant is being equipped with the latest facilities for the production of alkyd resins, other synthetic resins, and oleo-resinous varnishes.

The eight sales department representatives shown in the first row of this illustration recently received 25-year service awards from the J. B. Ford Division of Wyandotte Chemicals Corporation.

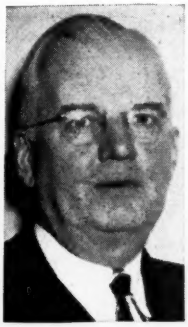
Wilson Named Pennsalt Safety Coordinator

Vance N. Wilson has been appointed safety coordinator for the Pennsylvania Salt Manufacturing Company, according to an announcement made by Frederick C. Abbott, manager of personnel and labor relations. Mr. Wilson, a graduate of the University of Michigan with a degree in economics, joined Pennsalt in February 1941. He enlisted in the Navy early in 1942 and saw service in both the Atlantic and Pacific areas. He held the rank of lieutenant when separated from service early in 1946.

Upon his return to Pennsalt in June 1946, Mr. Wilson was named supervisor in charge of tank cars in the traffic department.

New Executive Positions Created at Zapon

E. H. Bucy, general manager of the Cellulose Products Department, Atlas Powder Company, announces the creation of several new executive positions at the company's Stamford, Connecticut plant. J. M. Howard has been appointed to the recently created post of general manager of the Industrial Finishes Division. Mr. Howard, an employee of the Zapon Division for many years, formerly held the position of director of sales. In his new capacity, he will have full responsibility for the Technical and Production Departments, as well as supervision of all sales activities.



J. M. Howard

D. A. Metz, formerly assistant director of sales, has been made assistant general manager of the Stamford Zapon Division, and K. R. Longnecker becomes sales administrator of this division. In addition, all production for the Industrial Finishing Division will be under D. F. Paight, superintendent, who will report to Mr. Howard. M. T. Riley is the assistant superintendent.

Goss Joins Wagner Brothers

With its designation as Eastern Michigan distributor for J. C. Miller buffing compounds, Wagner Brothers, Inc., Detroit 3, Mich., manufacturer and supplier of metal-finishing materials and equipment, has announced the appointment of Ed Goss to its sales staff. Mr. Goss will handle sales of the J. C. Miller compounds and buffs, grain, belts, and other abrasive products distributed by the firm.

Ed. Goss

Well known in metal-finishing circles, Mr. Goss has a record of 12 years' sales and production experience in the field of polishing and buffing materials.

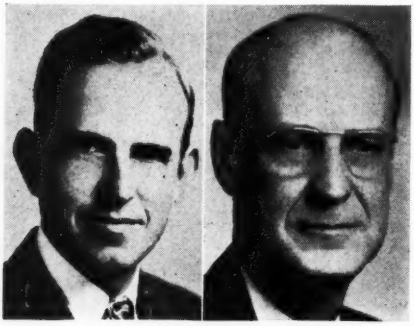
Carborundum Appointments

In order to make possible a closer and more effective contact between field sales activities and the sales management organization, The Carborundum Co., Niagara Falls, N. Y., announces several appointments to its sales organization. W. T. McCargo has been named assistant director of sales in charge of operations in the Western Region, with headquarters in Chicago. Mr. McCargo had previously held the title of regional sales manager. John S. Hawley, formerly manager of the commercial research department at Niagara Falls, has been appointed assistant director of sales in the Central Region, with headquarters in Cleveland. John G. Fritzinger, formerly district sales manager at the company's branch in Philadelphia, has been appointed assistant director of sales, with jurisdiction over the Eastern Region. His headquarters will be in Philadelphia.

Succeeding Mr. Fritzinger as district sales manager in Philadelphia is R. R. Huntington. Previously, Mr. Huntington was a member of the company's sales staff at Cleveland, covering all important industrial accounts in that territory. The above named appointees will function under F. J. Tone, Jr., vice president and general sales manager, and C. E. Hawke, director of sales.

Stallcup Promoted by Glidden

Dr. W. David Stallcup has been named manager of the Naval Stores Division of The Glidden Company, Cleveland, Ohio, according to an announcement made by Paul E. Sprague, vice president and assistant to the president. Dr. Stallcup succeeds E. W. Colledge, who has relinquished his Glidden duties to devote full time to the business of E. W. Colledge,



(Left) Dr. W. David Stallcup
(Right) E. W. Colledge

G.S.A. Inc., Jacksonville, of which he is president and which will continue in the capacity of sales agent for the products of the Glidden Naval Stores Division.

Formerly assistant general manager of the division, Dr. Stallcup is a graduate of the University of Florida in chemistry, where he also obtained his doctorate in the same subject. He joined the Glidden Naval Stores Division as a research chemist is 1943 and was named assistant general manager of the division in 1946. Under the general supervision of Mr. Sprague, he will direct operations of Glidden's Naval Stores plants at Jacksonville and Valdosta, Georgia.

New Metal-Clean Officers

According to an announcement made by the Metal-Clean Solvent Corporation, Chicago, J. W. Davy has been elected president of the firm following the resignation of C. H. Templin. W. L. Aveck has replaced P. O. Robertson as secretary-treasurer. Other new officers of the company include C. J. Beyer, vice president, and B. E. Baranski, vice president of special accounts.

Pennsalt Changes Name of Acidproof Cement

The Pennsylvania Salt Manufacturing Company announces a change in the name of one of its acidproof cements. Formerly designated as Asplit F Cement, the product is now identified as Pennsalt HF' Cement. According to Joseph J. Duffy, Jr., manager of sales of the Special Chemicals Division, the new name is more in conformity with other company named products, with the HF part denoting the cement's complete resistance to hydrofluoric acid in all strengths.

Pennsalt HF, a resin type cement, is one of 11 corrosion-resistant cements manufactured by the company.

International Conference on Surface Reactions

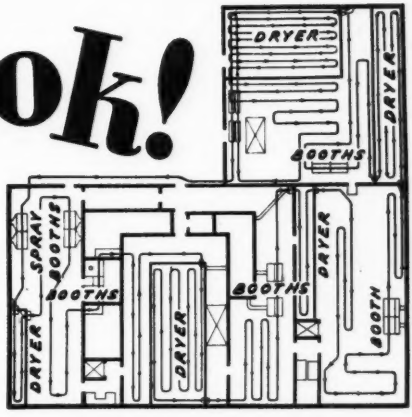
The Pittsburgh International Conference on Surface Reactions will be held at the Mellon Institute for Industrial Research in Pittsburgh, June 7-11, 1948.

The Conference Committee is made up of the following: Dr. Earl Gulbransen (Westinghouse Research Laboratories), Chairman, representing The Electrochemical Society, Pittsburgh Section; Prof. D. S. McKinney (Carnegie Institute of Technology) representing The University Conference on Corrosion and Metal Protection; Prof. Mars Fontana (Ohio State University) representing The Electrochemical Society, Corrosion Division; J. M. Bialosky (Research Laboratory, Carnegie-Illinois Steel Company) representing The National Association of Corrosion Engineers; Dr. J. W. Hickman (Westinghouse Research Laboratories) representing The Pittsburgh Physical Society; C. Pogocar (Mellon Institute for Industrial Research) representing The American Society for Metals, Pittsburgh Chapter; Dr. George H. Young (Mellon Institute for Industrial Research) representing The American Chemical Society, Pittsburgh Section; and Richard Rimbach (Corrosion Publishing Company) representing The Corrosion Forum.

George B. Fletcher Passes

The Cambridge Wire Cloth Co., Cambridge, Md., announces the death of its Chicago representative, George B. Fletcher, on December 2, 1947, after a long association with the company.

Look!



NO HANDLING PROBLEMS WITH A KOCH *Conveyorized* FURNITURE FINISHING SYSTEM!

PRODUCES 125 CABINETS PER HOUR FOR SEWING MACHINE COMPANY

Excessive handling is costly when finishing furniture. So when a large mid-western sewing machine manufacturer approached us with this problem, we installed a KOCH *Conveyorized* furniture finishing system.

This system eliminates all handling except at the loading and unloading station . . . provides faster, smoother production of quality finishes with rejects kept to an all-time low!

That's because the finishing cycle is properly balanced to provide proper timing for flow-out, drying, cooling, sanding and rubbing.

The oven atmosphere is temperature and humidity-controlled to assure uniformly high quality results.

Write TODAY for details on a KOCH custom-built conveyorized finishing system for your plant.

Phone, Wire or Write TODAY for More Information!

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Sales offices in leading industrial centers:

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Koch Indust. Equip., Inc.
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LOS ANGELES
Industrial Systems Co.
341 S. Central Ave.

Deans Appointed Regional Director

The appointment of Thomas E. Deans as regional director of the Minneapolis Division of The Glidden Co., Cleveland, Ohio, is announced by A. D. Duncan, vice president. Mr. Deans started with Glidden in 1925 in the stock department, then served in the advertising department, and later became a salesman in the trade sales division of the company. He enlisted in the Army in 1943 and rejoined Glidden in 1945 as sales manager of the St. Louis Division.

Thomas E. Deans

The region Mr. Deans now heads includes all of Minnesota, the Dakotas, Montana, and sections of Iowa, Wisconsin, and Michigan.

David Down Awarded Nuodex Fellowship

The Nuodex Products Co., Inc., Elizabeth, N. J., manufacturer of chemical paint driers and other prime chemical specialties, has announced that the $1,000 Nuodex Fellowship sponsored by its Canadian affiliate, Nuodex Products of Canada Ltd., has been awarded to David Down, research student of the University of British Columbia. The award was presented at a meeting of the Montreal Paint and Varnish Production Club by George Fearnley, chairman of the Nuodex Fellowship Management Committee, representing the technical interests of the Canadian paint and varnish industry.

Dr. R. V. V. Nicholls, associate professor of organic chemistry at McGill University, who will direct the work under the fellowship in cooperation with the Nuodex Fellowship Management Committee, announced at the meeting that the work will proceed under the general title "The Mechanisms of the Drying of Oils." According to Arthur Minich, vice president in charge of research development of Nuodex Products Co., Inc., the Nuodex Fellowship was instituted in recognition of important research work in the field of driers and drying carried out by the Montreal Paint and Varnish Production Club during the past 12 years and is dedicated to the advancement of research and the development of technical data which will be of important benefit to the paint and varnish industry of Canada and the United States as well.

DeVilbiss School of Spray Painting

Spray painting classes for industrial finishers for the first half of 1948 are being announced by the DeVilbiss School of Spray Painting in Toledo, Ohio. The intensive one-week courses will begin on February 2, March 1, May 10, and June 7.

All users of DeVilbiss equipment are eligible for this tuition-free instruction on the spray painting technique, the function and care of spray equipment. Those interested should write for reservations to The DeVilbiss Co., 300 Phillips Ave., Toledo 1, Ohio.

Phillips Appoints Sales Engineer

As part of a long range expansion program, the Phillips Manufacturing Co., Chicago, Ill., announces the appointment of A. Otto Miller as sales engineer for the State of Indiana. Mr. Miller, who has had many years of service in the vapor degreasing and metal-cleaning industry, attended Cornell University, Ithaca, N. Y., and was previously associated with the Detrex Corporation.

A. Otto Miller

Boden Named Development Director

Robert O. Boden, currently serving as national president of the American Society of Training Directors, has been ap-

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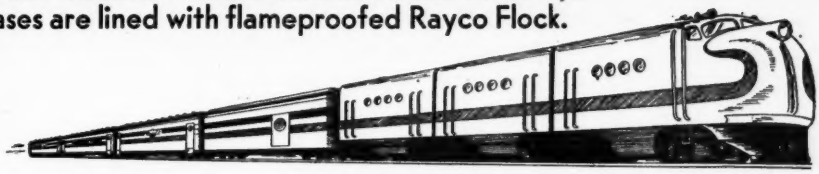
"SPANGLES"

Rayco Flock Synthetic Finishes

IN ANY COLOR—ON ANY MATERIAL

In the FREEDOM TRAIN the historical document cases are lined with flameproofed Rayco Flock.



Rayon Processing Co. of R. I., Inc.

PIONEER PRODUCERS OF SURFACE COATING FLOCKS

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COLONIAL PROCESS SUPPLY CO.
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908 S. Main St.
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ATLAS SPEC. MFG. CO.
3255-59 S. Shield Ave.
Chicago 16, Ill.

W. H. HALL
182 Jarvis St.
Toronto, Ontario

pointed development director for the Pittsburgh Plate Glass Company, according to an announcement by George E. Dewey, personnel director for the firm. As development director, a newly established position in Pittsburgh Plate's personnel department, Mr. Boden will develop and assist the management of the firm's 27 glass, paint, and chemical producing plants in the establishment of programs directed toward training and maximum individual development of personnel. The program will be operated especially at the supervisor and foreman level.

After graduating from the University of Pittsburgh School of Business Administration in 1937, Mr. Boden joined Methods Engineering Council, Pittsburgh, Pa., as resident engineer. During his five years' association with this firm, he specialized in foremen training and development, industrial engineering training, and personnel counseling with a variety of firms in the Western Pennsylvania area.

Mr. Boden joined Pennsylvania Rubber Co., Jeanette, Pa., in 1942 as management engineer. Associated with the company for five years, he supervised foremen training and development, industrial engineering, labor relations, and personnel counseling, and served as arbitrator for the company. From 1941 to 1946, Mr. Boden served as an instructor of engineering methods and management subjects at Pennsylvania State College evening school. During the following two years, he served in a similar capacity at the University of Pittsburgh's evening school, teaching classes in production supervision and management techniques.

Buckeye Products Appoints Distributor

According to an announcement made by The Buckeye Products Co., Cincinnati 16, Ohio, manufacturer of Speedie compositions, the Jacob Hay Co., 4014 W. Parker Ave., Chicago, Ill., is handling the complete line of Speedie buffing and polishing compounds in Northern Illinois and Wisconsin. This company is not only in a position to recommend the proper type of composition for any type of buffing and polishing job but, to expedite deliveries, is maintaining in its Chicago warehouse a stock of tripoli, stainless steel, chrome, nickel, emery cake, grease stick, and satin finish.

In the Rochester, New York area, Speedie buffing and polishing compounds are handled by the Scobell Chemical Company; in the Detroit area, by the A. T. Wagner Company; and on the West Coast, by the E. B. Dunn Co., Los Angles, California.

W. G. Sheane Joins Atlas Technical Staff

In keeping with plans to augment technical personnel and increase plant facilities, the Zapon Division of the Atlas Powder Company announces that W. G. Sheane, prominent chemical engineer, has joined its technical staff. Mr. Sheane, holder of two degrees in chemical engineering, is perhaps best known in the finishing industry as a former editor of "Organic Finishing" magazine. Prior to serving in that capacity, he was with the American Can Company, New York City, as a chemical engineer, and prior to that was five years with General Electric as a finishing engineer.

Mr. Sheane is a graduate of Rensselaer Polytechnic Institute and Carnegie Institute of Technology. He is an active member of the American Institute of Chemical Engineers, the American Chemical Society, and the American Electroplaters' Society.

ALLWOOD

"Vienna Brand" Lime

Made from Limestone that is identical in chemical analysis and geological structure with European Imported Lime. Tests show a "lime cake" made from Allwood "Vienna Brand" Lime equals the finish made from imported lime.

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GOLD PLATING SOLUTIONS

In All Colors

Guaranteed 100% Pure Gold Content

Troy Weight - Color Constant

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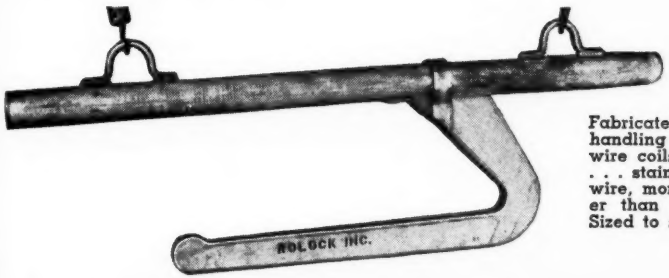
PROCESSING CARRIERS

The smooth flow of products and parts through finishing processes . . . easily handled in Carriers best suited to the specific job, means less rejects, lower costs.

Rolock baskets, trays, racks, crates, fixtures, retorts and muffles are created to keep pace with today's high speed machine production. Carrier weights are reduced yet loads increased, with service hours greatly extended thru better materials, design improvements. Note this example of Rolock construction.



Fabricated Pickle Hook, for handling 1500 lb. loads of wire coils in sulphuric acid . . . stainless steel for brass wire, monel for steel. Lighter than cast hooks, safer. Sized to suit tank.

Write to ROLOCK, INC., 1400 Kings Highway, Fairfield, Connecticut

4RL 48

CUSTOM-BUILT for Better Work, Easier Handling, Lower Cost

Elected Vice President and Director

Max C. Jones, president, announces that Frederick P. Hauck has been elected vice president and director of the Michigan Abrasive Co., Detroit, Mich. Mr. Hauck was first associated with Michigan Abrasive as a technical consultant. After several years in this capacity, he was induced to devote his entire time to the company as factory manager in charge of both production and research.

Frederick P. Hauck

Born in New York City, Mr. Hauck received his elementary and high school education there. After his graduation he then enrolled in New York University where he obtained a chemical engineering degree. Before coming ing to Detroit, he was associated with an Eastern abrasive manufacturing company, where he also was in charge of production and research.

New Executive Appointments Announced by Darco Corporation

At a recent board of directors meeting, the Darco Corporation, maker of activated carbon, appointed Louis M. Gill as company general manager, and Edgar W. Harris as director of sales. Mr. Gill, who has been director of sales for Darco, first came with the company in 1923 as a salesman. He is a chemical engineer with a degree from Georgia Tech, and is a past vice president of the American Oil Chemists' Society.

Mr. Harris, the new director of sales, has been with Darco since its formation, and had been in charge of sales to the sugar industry for some years. At the present time he is a director of the Sugar Division of the American Chemical Society, and a member of the International Commission for Uniform Methods of sugar analysis.

Monsanto Chemical Appoints Group Leader

Ralph Marotta, research chemist with the Monsanto Chemical Company, has been appointed group leader of the lacquer and coatings exploratory unit at the company's Merrimac Division headquarters in Everett, Massachusetts. Mr. Marotta will be responsible for the development of surface coatings from raw materials and will also supervise the development of coatings from resin developed in cooperation with other Monsanto research groups working with polymers.

Hennessy Named Special Chemicals Sales Manager

The appointment of William J. Hennessy as Pittsburgh district sales manager for the Special Chemicals Division of the Pennsylvania Salt Manufacturing Company has been announced by Joseph J. Duffy, Jr., manager of sales. A graduate chemist from St. Joseph's College, Mr. Hennessy joined Pennsalt in July 1935. After several years' experience in manufacturing operations at the Greenwich plant in Philadelphia, he joined the Special Chemicals Division as a salesman in June 1939.

As head of the Pittsburgh district, Mr. Hennessy will supervise special chemicals sales operations in the Pittsburgh, Cincinnati, Cleveland, Buffalo, and Altoona territories. Mr. Hennessy is president of the Pittsburgh Branch of the American Electroplaters' Society.

Verzier Joins Lupomatic

According to an announcement made by Charles W. Yerger, president, Le Verne Verzier has joined Lupomatic Industries, Inc., New York, N. Y., in the capacity of director of development. A graduate of Rensselaer Polytechnic Institute and former chief chemist of Lea Manufacturing Company, Mr. Verzier brings to Lupomatic a wealth of research and practical experience in abrasive compounds for finishing both in the laboratory and in the field. His chief function with the company will be to develop the science of tumbling.

Mr. Verzier is a member of the American Chemical Society, the Electrochemical Society, and the American Electroplaters' Society, as well as a professional chemical engineer.

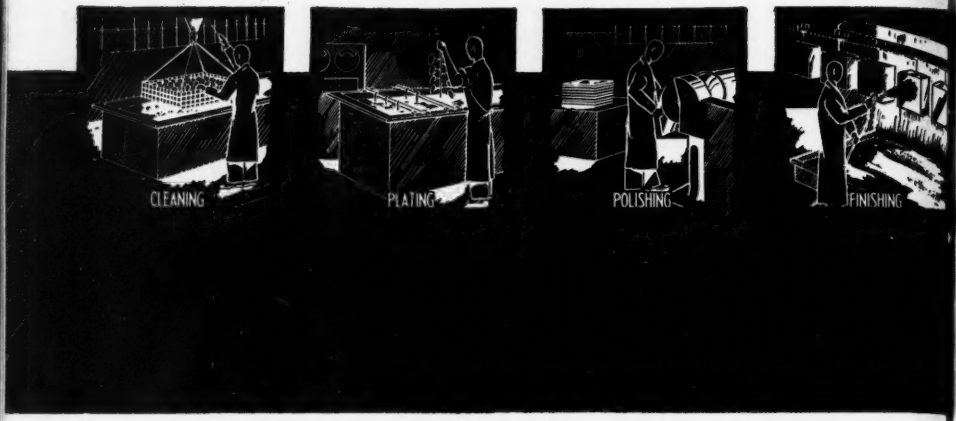
that aid in appearance and utility

Excellent examples of modern tin printing art, these colorfully lithographed metal containers used for packaging crystallized ginger candies feature five colors which are blended to form the oriental motif lithographed on the outer surface of each can.

(Photo courtesy Can Manufacturers Institute)

The frame of this folding chair for hotel, restaurant, club, hospital, marine, and institution usage is made of lightweight, sturdy magnesium which is finished in natural shades of metal, maple, mahogany, or walnut to harmonize with the finest metal or wood furniture.

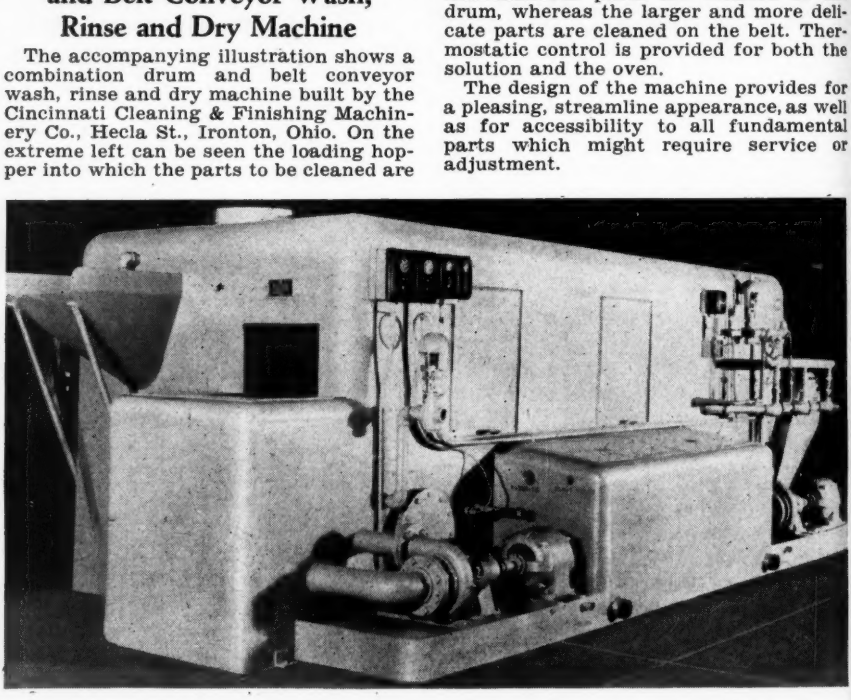
(Photo courtesy Louis Rastetter & Sons Co., Fort Wayne 1, Ind.)



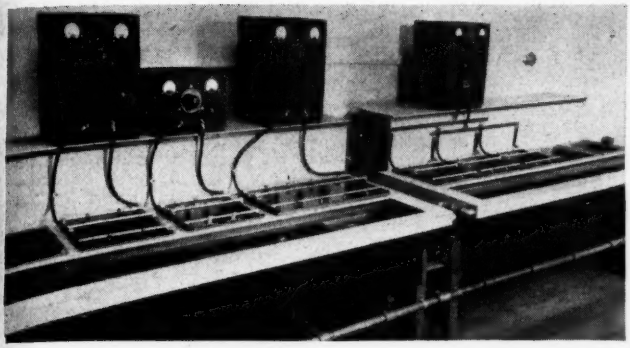
Cincinnati Combination Drum and Belt Conveyor Wash, Rinse and Dry Machine

The accompanying illustration shows a combination drum and belt conveyor wash, rinse and dry machine built by the Cincinnati Cleaning & Finishing Machinery Co., Hecla St., Ironton, Ohio. On the extreme left can be seen the loading hopper into which the parts to be cleaned are fed. To the right is the loading station for the belt conveyor parts. The small miscellaneous parts are cleaned in the drum, whereas the larger and more delicate parts are cleaned on the belt. Thermostatic control is provided for both the solution and the oven.

The design of the machine provides for a pleasing, streamline appearance, as well as for accessibility to all fundamental parts which might require service or adjustment.



Cincinnati Combination Drum and Belt Conveyor Wash, Rinse and Dry Machine



Prefabricated Plating Plant

sary, each plating tank may have a separate selenium rectifier with continuous voltage control over the entire range. The rinse, dip, and pickle tanks are located in front of, or adjacent to, the plating tanks.

Prefabricated Plating Units and Plants

For platers and manufacturers of all metal and plastic products requiring plating, Unit Process Assemblies, Inc., 75 E. 4th St., New York 3, N. Y., is now offering prefabricated plating units and plants which are adaptable for laboratory or production purposes. In addition to use in the plating of all metals, the equipment can be used for anodizing, electropolishing, and electroforming.

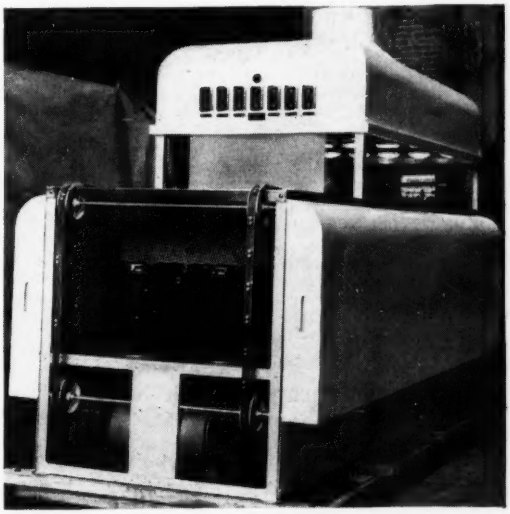
According to the manufacturer, the prefabricated plating units and plants are designed to reduce losses from plating rejects and require a minimum of labor for installation. A built-in stainless steel drain system is said to prevent acid spillage, thus eliminating the need for a cement floor. Plumbing and electrical lines can be quickly assembled into a predesigned position using only a screw driver and wrench, it it claimed.

The prefabricated plating plant includes all necessary plating and processing tanks, rectifiers, and built-in gas, electrical, water, drain, and exhaust lines. Supplied "knocked down," the equipment is said to require only connection to main utility lines and is available in standard models for all types of plating and in a wide range of capacities. It may be custom-built if desired. Where neces-

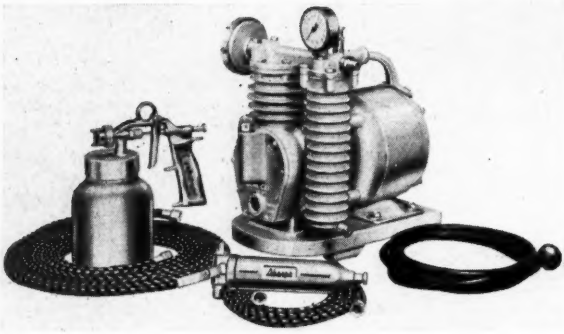
Koch "Gyra-Flow" Automatic Finishing Machine

An automatic finishing machine for the rapid production of small parts is announced by George Koch Sons, Inc., Evansville 4, Ind. Designated as the "Gyra-Flow," the machine is designed to wash, rinse, dry, dip, spray, and bake parts in one continuous cycle and is available in standard sizes providing from 2 to 20 interchangeable operations.

The conveyor of the unit is a steel belt to which a series of spring-type clips are removably fastened. Each clip, being equidistantly spaced, is designed to support one or more workpieces through



Koch "Gyra-Flow" Automatic Finishing Machine



Sharpe "Bearcat" Portable Paint Spraying Unit

every successive process to completion. The conveyor belt may be shortened or lengthened and is joined by riveting. Belt travel is constant, with the belt being spirally passed around a series of horizontally mounted rotating drums and moving across each drum from left to right or right to left. Timing is regulated by the selected belt speed, together with a determined number of spiral turns around each drum—necessary to produce the correct number of minutes through any one of the several operations. Loading and unloading may be manually or fully automatically accomplished. Finished articles are returned to stations at each end of the machine entirely without handling.

According to the manufacturer, tearless dipping is accomplished with the Gyra-Flow by flow-out and the initial set developed by gyration of the work after passing once through a small volume, level controlled paint dip tank: Spraying may be effected electrostatically or automatically using multiples of electrically-operated spray guns exhausting into a water-wash cabinet. The machine may be used with any of the various paints, varnishes, oils, enamels, sealers, shellacs, or synthetics of either the air-drying or baking types requiring temperatures below 500 deg. F. The usual cleaning solvents and surface preparations can be readily employed.

Sharpe "Bearcat" Portable Paint Spraying Unit

The Sharpe Manufacturing Co., 1224 Wall St., Los Angeles 15, Calif., is now marketing a portable paint spraying unit under the trade name of "Bearcat." The unit includes a direct ⅓ h.p compressor which provides a cubic foot displacement of 2.6 and is designed for operation at 35 lb. pressure.

Constructed to provide for a minimum of parts without sacrificing air capacity or durability, the Sharpe Bearcat Portable Paint Spraying Unit weighs less than 40 lb. complete with motor, thus enabling it to be easily handled. The complete unit comprises all equipment as shown in the accompanying illustration.

Warner "Red Cap" Spinner Type Roof Ventilator

Identified as the "Red Cap," a spinner type roof ventilator made by the Warner Ventilator Co., La Grange, Ind., is equipped with a step-type ball bearing. The vertical, machined shaft on which the revolving head or blades are mounted is inserted in a tube filled with weather-re-

Warner "Red Cap" Spinner Type Roof Ventilator

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A *Watson-Standard* FINISH

Whether your product is made of wood, metal, paper, foil or plastic—there's a Watson-Standard coating to meet your requirements of exterior durability. In addition to the large number of Watson-Standard coatings already formulated and available, our research laboratories are ready to create to your specifications a coating that is prescription made for your product. We'll be glad to discuss your needs in detail.

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Manufacturers of
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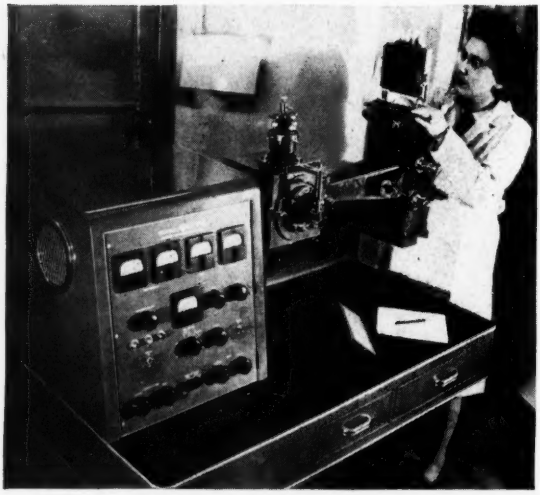
Rx TOUGH JOB HEADQUARTERS
Prescription Finishes
Give us your metal coating problem. We guarantee you an answer based on your conditions and not just a standardized formula.



G-E Electron Diffraction Instrument

sistant lubricant and rests on the step-type bearing, thus assuring easy propulsion of the unit from the slightest breath of air. The spinning blades create a vacuum, thereby sucking or drawing hot air, gases, fumes, or other contamination out of painting shops, plating tanks, processing plants, and so on. The blades are shaped and spaced so as to emit contaminated air without permitting the entrance of rain or snow.

The spinner unit is mounted on a square base which can be readily cut to fit roofs of any pitch. Units with circular bases for mounting on stacks are also available.

G-E Electron Diffraction Instrument

An electron diffraction instrument which is designed to aid in the observation and measurement of surface conditions of metals, ceramics, and plastics has been announced by the Special Products Division, General Electric Co., Schenectady 5, N. Y. The instrument is claimed to be particularly useful in the investigation of problems associated with corrosion, catalysts, lubricants, metallurgy, pigments, surface deposits, and graphite; it is designed to show the crystal structure of surfaces and thin specimens up to 500 Angstrom units.

To operate, a beam of electrons is directed at the specimen being tested, and any resulting diffraction pattern is photographed. The pattern consists of rings whose diameter, intensity, and orientation provide information for determining composition, orientation, and size of the crystals present. The instrument consists of one unit containing a vacuum chamber with specimen manipulator, visual and photographic recording camera, electron gun and beam focusing elements, regulated high voltage power supply, and complete vacuum pumping equipment. The specimen chamber permits the examination of specimens ranging from 0.1 to 4 inches in diameter.

Milwaukee Tru-Cut Shatterproof Sanding Disc

A shatterproof sanding disc which is designed to provide for maximum safety, together with increased production, in performing sanding operations on a wide variety of metal products is announced by the Milwaukee Motive Manufacturing Co., 932 W. Lapham St., Milwaukee 4, Wis. Made of a new type resin bond and newly developed backing material, the disc, which is designated as the Tru-Cut, is claimed to hold together under the most severe strain.

Moreover, the disc, according to the manufacturer, is odorless when in operation and is constructed to withstand high frictional temperatures. It is available in double-face as well as single-face types.

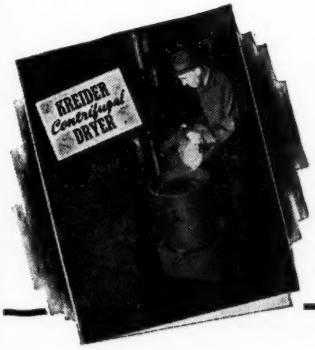
Chelsea Series DXB Heavy Duty Booster Fan

Designated as the Series DXB, a heavy duty booster fan for use in paint spray booths, for the removal of fumes, and for use where excessive heat is encountered is now being offered in five sizes by the Chelsea Fan and Blower Co., Inc., 1200

HIGH SPEED DRYING

Eliminate profit-consuming production lags with the modern, speedy Kreider Centrifugal dryer. This economical and efficient dryer is engineered for one-man operation and dries a basketful of small parts in only 35 seconds. V-belt drive. ¾ H.P. motor. Available with or without auxiliary heating unit.

CUTS COSTS



Send for FREE illustrated bulletin giving complete specifications and showing applications of the Kreider Dryer in modern manufacturing plants.

DELLINGER MANUFACTURING COMPANY

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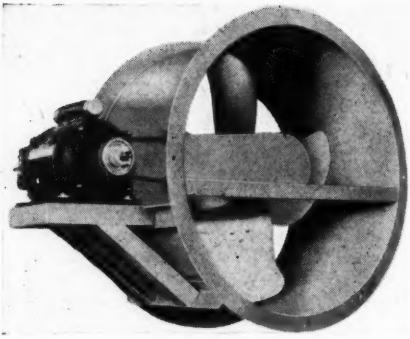


Chelsea Series DXB Heavy Duty Booster Fan

Grove St., Irvington, N. J. According to the manufacturer, the fan is unusually rugged in construction and extremely quiet in operation for a unit handling large volumes of air. The fan shaft and motor are ball bearing mounted to provide for smooth performance, long life, and economy of operation. The blades are made of non-ferrous metal.

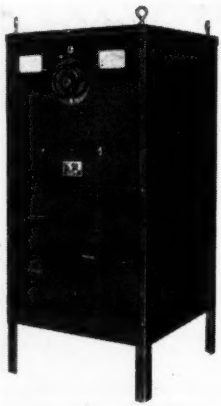
Designed for either vertical or horizontal operation, the Chelsea Series DXB Heavy Duty Booster Fan is available in five propeller diameters of 16, 20, 24, 30, and 36 inches having capacities of 2,000, 2,500, 4,400, 7,400, and 9,500 c.f.m. respectively. The 16 and 20-inch sizes are each powered by a ¼ h.p. motor, the 24-inch size by a ⅓ h.p. motor, and the 30 and 36-inch sizes each by a ½ h.p. motor.

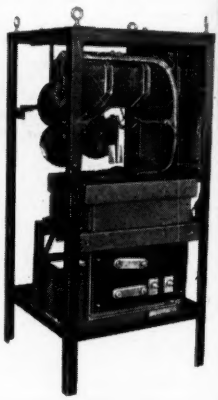
Mellaphone N600 VQ Rectifier

Identified as the N600 VQ, a low-voltage high-current rectifier for operation from 220 or 440-volt 3-phase a.c. power lines is now being manufactured by the Mellaphone Electronic Rectifier Co., Inc., Rochester 2, N. Y. The d.c. output voltage can be varied from 0 to 6 volts with a capacity of 600 amperes, or varied from 0 to 12 volts with a capacity of 300 amperes.

The Mellaphone N600 VQ Rectifier is primarily intended for use in electroplating and electrolytic cleaning, but is also claimed to provide an ideal source of power for the production testing and running in of 6 and 12-volt d.c. motors, and so on. Features of the rectifier include selenium rectifier elements which are thoroughly sealed and designed to provide for high efficiency, unlimited life, quiet operation, and good voltage regulation. The heavy duty variable voltage transformer of the unit is designed to provide for smooth stepless control over output voltages from zero to maximum setting.

The rectifier, which is completely self-contained and includes a 4½-inch ammeter and voltmeter, features protection against overloads and failure of the ventilation system. According to the manufacturer, the unit is conservatively designed and will withstand a considerable degree of overloading without danger of overheating either the transformer or rectifier stacks.



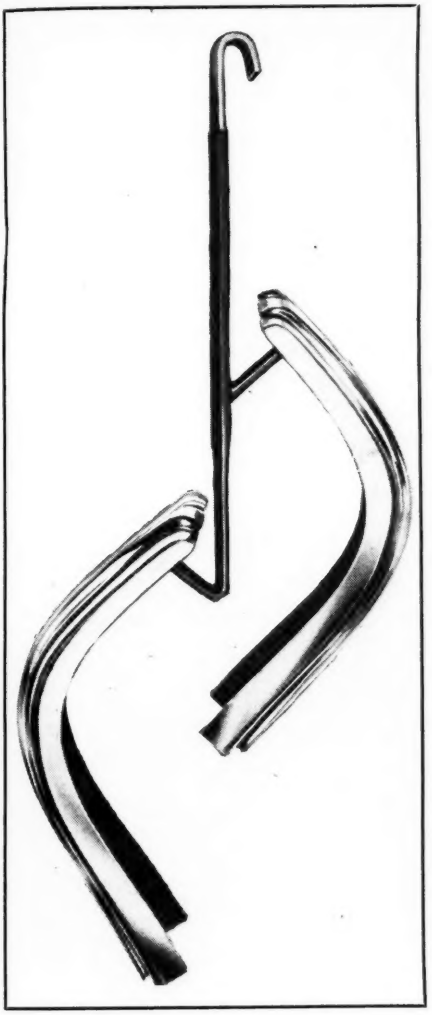


Mellaphone N600 VQ Rectifier

Interchemical Inclined Tube Viscometer

For the accurate measurement of the viscosity of all clear liquids, the Henry A. Gardner Laboratory, Inc., Apparatus Division, 4723 Elm St., Bethesda, Md., has developed the Interchemical Inclined Tube Viscometer illustrated herewith. Simply and sturdily constructed, the instrument includes only one adjustable member, the adjustment of which can be checked when necessary by making a determination on a standard tube.

PASTE



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No evaporation; not inflammable. All solids; no loss. Single coat gives thick and extremely tough coating which has long operating life.

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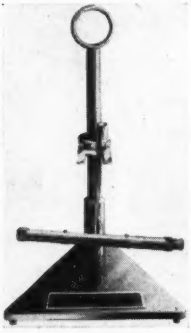
New material. New method of handling. Requires baking to convert from Paste to solid. BUNATOL No. 1000 Paste Insulation has extra fluidity and handles fast without delays or trouble. Get the facts—prices.

NELSON J. QUINN CO.

TOLEDO 7, OHIO

Results are obtained on a continuous scale in fundamental units. With the instrument, the smallest scale graduation is one hundredth of a stoke or one centistoke. Only one standard tube is required for use with the instrument, this tube being employed for calibration purposes only. The specimen tubes used are checked for satisfactory performance before being released for routine viscosity measurement. According to the manufacturer, erroneous measurements due to temperature variations are eliminated when determinations are made beneath the surface of a constant temperature water bath. Viscosity can be determined at any temperature within the range of the liquid bath.



Interchemical Inclined Tube Viscometer

The Interchemical Inclined Tube Viscometer is described as very accurate. Operator error can be practically eliminated by averaging multiple readings. Viscosities from 0.6 to 150.0 stokes can be measured without readjustment. However, if the majority of determinations are above 30.0 stokes, the apparatus can be set to provide results in shorter time intervals. Only a very small amount of any test specimen is said to be required. The test specimen is contained in a closed tube during measurement, thereby obviating errors that might be accrued due to evaporation or chemical reaction.

Chem-Electro Electropolishing Method for Stainless Steel

An electropolishing method of particular interest to the men responsible for the appearance and finish of articles and parts made of stainless steel is announced by Chem-Electro Laboratories, Inc., 2561 N. Clark St., Chicago 14, Ill. With the method, metal is removed from the surface in a fairly uniform layer, exposing the virgin metal beneath. The process, it is claimed, provides for the removal of no chromium, only a trace of nickel, and an average of 3 per cent iron, thereby making the electropolished surface unusually resistant to corrosion. In addition, the anodic polarization which takes place during the process equalizes the various potentials and passivates the surface of the metal, thereby further increasing its resistance to corrosion, it is stated.

Surface finishes ranging from a satin luster to a full bright polish can be produced by the Chem-Electro Electropolishing Method. The governing factors are the duration of the electrolytic action, the type of steel, the design of the work holding fixtures, and the condition of the surface. While the method is not designed to remove surface imperfections, scratches, orange peel, and so on, it is claimed to provide for the removal or greatly reduced production of burrs and sharp edges, since the action starts at the high points and the surface of the grains is leveled and made lustrous without distortion and internal stress.

Titeflex Inconel Flexible Tubing

Titeflex, Inc., 422 Frelinghuysen Ave., Newark, N. J., announces a flexible tubing made with Inconel innercore and braid and which may be supplied for temperatures up to 1,700 deg. The innercore of the tubing is available in wall thicknesses of from 0.005 to 0.015 inch. The thicker wall tubing is recommended where high pressure is encountered, and the thin wall tubing where the pressure is not over a few hundred pounds per square inch and the weight is critical.

Titeflex Inconel Flexible Tubing

According to the manufacturer, the construction of the Titeflex Inconel Flexible Tubing is such as to resist failure caused by excessive vibration. The hose may be supplied with flat ribbon on round wire braid. The flat braid is recommended for high pressures and resistance to fatigue, especially to sizes of 1 inch or more. Applications for the tubing include chemical equipment where the corrosion-resisting properties of Inconel are a prime requisite.

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Use it to
SPREAD
the national debt!

WITH MANAGEMENT BACKING,
PAYROLL SAVINGS PLAN CAN HELP BUSINESS AND NATION

In 19,000 companies, "Payroll Savings" has made employees more contented in their jobs—has cut absenteeism—even reduced accidents! It builds financial security for each participant. (U. S. Savings Bonds pay $4 at maturity for every $3 invested.) And it helps business generally:

SPREADING THE NATIONAL DEBT HELPS SECURE YOUR FUTURE

Your business is closely dependent upon the national economy, which will be strengthened by distribution of the public debt as widely as possible. How that works is clearly, briefly described in the free brochure shown below.

EXECUTIVE BACKING IS VITAL

Despite the many benefits of "Payroll Savings," its success in your company is liable to dwindle unless a responsible executive keeps it *advertised.* Make sure the Plan is vigorously maintained! Your U. S. Treasury's State Director, Savings Bonds Division will gladly help.

Free brochure *expresses views of two business leaders. Be sure to get your copy from the State Director... today!*

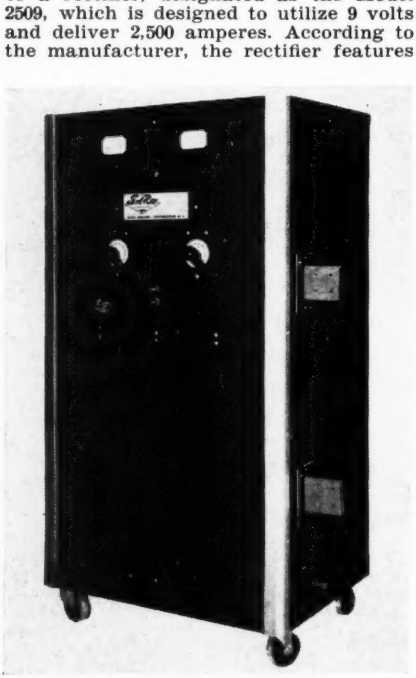
The Treasury Department acknowledges with appreciation the publication of this message by

PRODUCTS FINISHING

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and the Advertising Council

Bart-Messing "Sel-Rex" Model 2509 Selenium Rectifier

The Bart-Messing Corp., 45 Morgan Ave., Brooklyn 6, N. Y., announces the addition to its line of "Sel-Rex" selenium rectifiers of a rectifier, designated as the Model 2509, which is designed to utilize 9 volts and deliver 2,500 amperes. According to the manufacturer, the rectifier features



Bart-Messing "Sel-Rex" Model 2509 Selenium Rectifier

positive overload protection and includes stacks that are conservatively rated and triple coated for long trouble-free life.

The Sel-Rex Model 2509 Rectifier is designed for easy installation, all installation connections being externally made. Construction features of the unit include primary transformer taps to compensate for abnormal line voltages; quiet-operating fan; magnetic contactor; specially engineered heat-proof transformer; conservatively rated and designed to withstand high temperatures and corrosive atmospheres; life-time pilot light; large Weston meters (4½ inches square); Tygon-coated interior for protection against corrosion; positive protection against ventilation restriction; push-button control; continuous plating control which permits changing tap switch positions without plating interruption; and 60 positions of adjustment (coarse switch, 1 volt per step and fine switch, ⅛ volt per step).

The design of the Sel-Rex Model 2509 Selenium Rectifier permits ready access for cleaning the unit and oiling the fan. The rectifier measures 72 inches high x 36 inches wide x 24 inches deep and is supplied complete ready for use on 220 to 480 volts, 3-phase 60-cycle current.

Klem No. 74 Stripper

Designated as the No. 74, a chemical stripper that is said to efficiently remove gilsonite, rubber base, and metacrylate finishes is now being offered by Klem Chemicals, Inc., 14401 Lanson Ave., Dearborn, Michigan.

According to the manufacturer, the stripper is designed to remove stubborn paints and enamels in sheets; the paint film is not disintegrated and no residue is left on the surface. Hand scrubbing is said to be eliminated and the surface left clean for the next operation, thus making the stripper unusually effective and economical to use.

H-VM-W Improved Wrap-Rax Tape

An improved Wrap-Rax masking and stop-off tape which is said to provide greater thermal and chemical resistance than heretofore is announced by the Hanson-Van Winkle-Munning Co., Matawan, N. J. Characterized by increased ease of handling, the tape may be readily applied, after which it is heated to a temperature of 300-325 deg. F. to ensure adhesion at each lap of the winding.

The tape may also be used without fluxing in cases where service conditions are not severe, such as when using plated racks in room temperature baths. When the tape is used in this connection, the laps should be wider than usual, the wrapping tighter, and the final lap, in addition to being cemented, should be tied down to ensure retention of tension.

Using either of the above methods of application, the H-VW-M Wrap-Rax Tape is claimed to provide complete protection for severe and mild service conditions, respectively, in all kinds of electroplating and anodizing solutions.

Cellolyn 95 Resin

A resin designed specifically for use in pale-colored cellulosic lacquers is now being offered under the trade name of Celloyn 95 by the Hercules Powder Co., 949 Market St., Wilmington 99, Del. According to the manufacturer, the resin has been carefully designed to have excellent compatibility with both RS-type nitrocellulose and N-type ethyl cellulose.

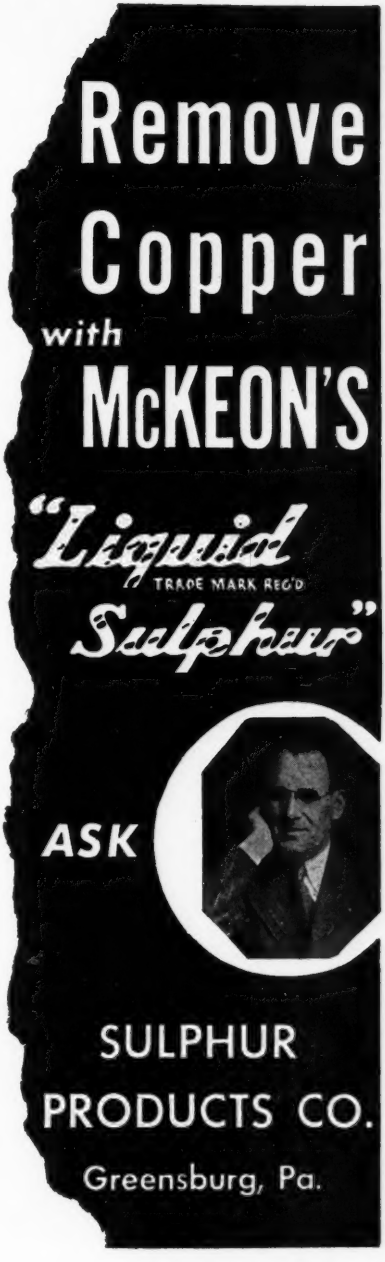
Outstanding features claimed for Cellolyn 95 Resin include its extra pale initial color and excellent color retention. Especially suited for the production of white pigmented metal lacquers, the resin is claimed to have unusual alcohol resistance and to be self-plasticizing, thus permitting formulation with nitrocellulose lacquers in the absence of chemical plasticizers. The resin is said to be suitable for use with ordinary lacquer solvent and diluent combinations.

"Anonizing" Process

A simple immersion method of protecting aluminum surfaces without changing the natural aluminum color, to be known as the "Anonizing" Process, is announced by the Technical Processes Division, Colonial Alloys Co., Ridge Ave. & Crawford St., Philadelphia 29, Pa. Aluminum which has been etched or mechanically, electrolytically, or chemically polished, as well as aluminum as furnished by the mill, can be treated by the process without noticeably changing the appearance, it is claimed.

The coating produced by the Anonizing Process resembles a clear glaze although it is not brittle. On some alloys, such as those containing substantial amounts of silicon, the surface of the metal darkens slightly, but after being coated has a glazed-china effect. Anonized coatings are claimed to provide good abrasion resistance, as well as resistance to smudging, oxidizing, fingermarks, ordinary handling, and high temperatures. The coatings are produced by simply immersing the cleaned aluminum into the hot Anonizing solution for a few seconds to a few minutes and then rinsing. The equipment employed can be of ordinary steel, and many items can be handled in batch, such as baskets.

The transparent protective coating produced by the process is also claimed to provide an excellent base for paints and lacquers. The Anonizing solution is said to have a long life and to require but little control.



"Cutter" Dermesthetic Ointment

Industrial rashes and other pruritic conditions are said to be afforded relief with "Cutter" Dermesthetic Ointment, product of Cutter Laboratories, Fourth and Parker Sts., Berkeley 1, Calif. The ointment combines benzyl alcohol, phenol, and benzocaine to obtain triple-action anesthetic control of itching. The benzyl alcohol acts immediately, but is short-lived. Phenol sets to work with moderate speed to provide intermediate, continuing relief, while slow-acting benzocaine brings up the rear to provide lasting comfort, it is claimed.

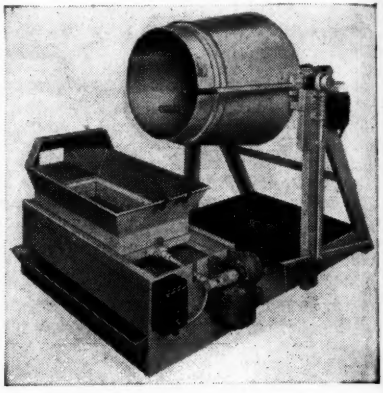
Cutter combines the three ingredients in a greaseless medium to provide greaseless Dermesthetic Ointment, which is said to be particularly useful in retarding the spread of grease-soluble irritants, such as rhus toxins and certain oil-soluble industrial materials which, in dissolving, tend to spread and increase the area of the rash. Being greaseless, the ointment can also be removed easily and will not stain the skin or clothes, it is stated.

In addition to its anesthetic effect, Cutter Dermesthetic Ointment is bacteriostatic, thus reducing the danger of secondary infection, the manufacturer claims.

YOU
CAN'T BEAT
TUFLEX
FOR
BULL-DOG
ADHESION ON
ANY METAL
Write for samples and
full information today.
COATING MATERIALS LABORATORIES
INCORPORATED
691 Main Street, Belleville, N. J.

Belke Combination Sawdust Barrel and Sawdust Separator

Fast and efficient drying of small parts before and after electroplating is said to be afforded by a combination steam-heated sawdust barrel and sawdust separator developed by the Belke Manufacturing Co., 947 N. Cicero Ave., Chicago 51, Ill. The steam-heated barrel is designed to dry the work in such a manner as to leave it bright, clean, and free from water spots. Steel ribs welded to the sides and bottom of the barrel are said to assure a positive tumbling action, thereby allowing the sawdust to dry the work with a polishing action.



Belke Combination Sawdust Barrel and Sawdust Separator

Tilting of the barrel provides for emptying of the work into the hopper of the separator which, upon being operated, sifts the sawdust into a convenient drawer below, leaving the clean work in the hopper. By tilting the hopper, the work is slid through the chute into a container.

Chelsea Type AA Utility Fan

Designated as the Type AA, a utility fan of unusually sturdy construction for equalizing temperature and humidity, as well as for drying and cooling, is announced by the Chelsea Fan & Blower Co., Inc., 1206 Grove St., Irvington 11, N. J. The totally-enclosed motor of the fan is equipped with ball bearings.

The Chelsea Type AA Utility Fan can

be floor mounted without any additional support or can be suspended at any location and at any angle in order to direct the air flow in any desired direction. The fan includes all-steel die-stamped and die-formed blades, and is equipped with

Chelsea Type AA Utility Fan

safety guards, front and back, and an extension cord and plug. The fan is available in two sizes; namely, the AA 20-inch model which is designed to deliver 3,000 cubic feet of air per minute, and the AA 24-inch model which is designed to deliver 4,800 cubic feet of air per minute.

Hot Dip Galvanizing Film

A 16 mm. motion picture sound film depicting zinc coating operations as performed by the hot dip galvanizing process industry is announced by the American Hot Dip Galvanizers' Association, Inc. Entitled "Must It Rust?", the film, which has a running time of 25 minutes, shows the art of the hot dip galvanizing process in complete operation. It depicts steel base metal actually rusting as viewed through a microscope; the "cleaning" of the base metal by the pickling process is shown and explained as is the "galvanizing" of various products. Also included are metallurgical photographs of the construction of a zinc coating by hot dip galvanizing and an explanation of its formation.

The film illustrates the use of galvanizing as a form of rust-proofing in the manufacture of electric power transmission equipment, railroad signal equipment, highway structural steel and associated products, fencing, playground equipment, observation and lookout towers, steel shipping containers, plumbing and heating piping, and other products. Primarily educational with an entertaining theme which makes it ideal for all types of audiences, the film is available for showing by writing to Mr. Stuart J. Swenson, secretary, Secretary and Treasurer, American Hop Dip Galvanizers' Association, Inc., 1611 First National Bank Bldg., Pittsburgh 22, Pennyslvania.

Hercules Hydroabietyl Alcohol

Production of an economical resin alcohol made from rosin which is said to have potential application in a wide range of industries, including adhesive, detergent, paint, varnish, and lacquer industries, is announced by the Hercules Powder Co., Inc., Wilmington, Del. Designated as Hercules Hydroabietyl Alcohol, the liquid is viscous at room temperature and is colorless, tacky, and nonmiscible with water. It is claimed to be unusually resistant to discoloration and degradation by light or air.

NO PEELING
NO FLAKING
NO CHIPPING!

TUFLEX

HAS
SUPER-ADHESION
ON ANY METAL

Write for samples and full information today.

COATING MATERIALS LABORATORIES
INCORPORATED
691 Main Street, Belleville, N. J.

Rush FybRglass Acid Brush

At the request of industrial users of acids for cleaning operations, The Eraser Co., Inc., 104 S. State St., Syracuse 2, N. Y., has developed the Rush FybRglass Acid Brush shown in the accompanying illustration. The brush is made with a soft tuft of FybRglass solidly imbedded in a wood handle of conventional shape. When wet, the FybRglass is said to become soft and pliable much the same as many ordinary brushes of comparable size.

Rush FybRglass Acid Brush

According to the manufacturer, the Rush FybRglass Acid Brush may be used in any acid which does not affect glass.

Metal-Clean Cleaning Solvent

The Metal-Clean Solvent Corp., 1935 N. Paulina St., Chicago, Ill., announces the development of a cleaning solvent for removing buffing compounds from metal. Unusually fast cleaning action and economy of use are advantages claimed for the product, which is a combination of synthetic and organic solvents, neutral in character and non-toxic.

To use, one part of the solvent is introduced into 10 to 15 parts of water and the solution is heated to a temperature of 190 deg. F. The parts to be cleaned, racked or in baskets, are then dipped into the solution for a period of from 1 to 4 minutes, with the result that the stearates of the buffing compounds are softened and removed from the crevices and orifices. This dip operation is followed by one or two hot, clean water spray rinses to remove the loosened buffing compounds from the parts.

"Acraclad" Metal Finish

Designated as "Acraclad," a finish for ferrous and non-ferrous metals has been developed by the Acryvin Corporation of America, Astoria, Long Island, N. Y. According to the manufacturer, the material is a one-step finish eliminating chemical and mechanical surface pretreatments on all metals. The only step that is said to be required before applying the finish is the usual precleaning or degreasing of the metal surface.

In addition, Acraclad Metal Finish is claimed to require a minimum of baking, a baking cycle of 10 to 20 minutes at temperatures ranging from 250 to 350 deg. F. being sufficient. The finish is described as non-toxic with extremely high corrosion resistance to acids, oils, alkalis, and salt spray. It can be applied by the spray, brush, dip, or roller coat method.

Divco Lead Anode with Cast Copper Hook

The development of a cast copper anode hook of special shape, which is said to facilitate anode handling, as well as assure efficient conductance and firm bonding to the anode body, is announced by the Division Lead Co., 836 W. Kinzie St., Chicago 22, Ill. Used on a Divco 71-point lead anode, the cast copper hook is claimed to double the current carrying capacity and further increase the overall efficiency made possible by the 71 throwing edges.

Divco Lead Anode with Cast Copper Hook

Fire Fighting Film

A technicolor motion picture entitled "Fire and How to Fight It" has been produced by Walter Kidde & Co., Inc., Belleville, N. J. The picture, which shows how various types of portable extinguishers can be used effectively against incipient fires, is especially recommended for any industrial concern which is planning a fire brigade training program.

The film is 16 mm. with sound track, has a running time of 23 minutes, and can be obtained free upon request to the Kidde Company.

New Literature

Chemical and Technical Stenography. Written and published by James Kanegis, P .O. Box 1121, Washington 13, D. C. 388 pages, 5½ x 8½ inches. Cloth binding, board covers. Price, $5.00.

A thoroughly comprehensive and practical text of 435 clearly and concisely arranged units prepared for easy reference, self-study, or teaching assignments, this book is based upon the author's knowledge of shorthand, his training and experience in chemistry and metallurgy, and his broad professional contacts in scientific and technologic fields, yet its study necessitates only a basic understanding of Gregg shorthand. Introductory matter, as well as interesting and unusual exercises embodying some of the latest developments in science and technology, are included. These exercises not only provide interesting classified dictation material but also serve to acquaint the reader with the necessary background information in science and a proper "feel" of its language and idiom.

The book presents a numeral shorthand for optional use, a set of abbreviating symbols new to shorthand and of universal applicability to all Gregg writers, and an extensive cross-referenced vocabulary of words, phrases, and abbreviations. The subjects covered include chemistry, metallurgy, mathematics, physics, electricity, general science, and certain phases of engineering and industry, with specific emphasis on the first two.

The book should prove valuable not only to reporters and other accomplished Gregg writers who wish to become adept at technical stenography but also to those who contemplate taking occasional technical matter or who are interested in the practical application of new shorthand principles to their daily assignments.

Onyx Technical Data Sheets. The Oynx Oil & Chemical Co., Jersey City 2, N. J., is now issuing two technical data sheets, one of which deals with Maprofix NEU Powder, an anionic surface-active material with unusual foaming properties, as well as excellent wetting, penetrating, and dispersing action. The other data sheet covers NSAE Powder, an anionic wetting agent with a wide field of usefulness as an assistant in detergent and dispersing operations, particularly in acid solutions. Copy of either or both sheets free upon request.

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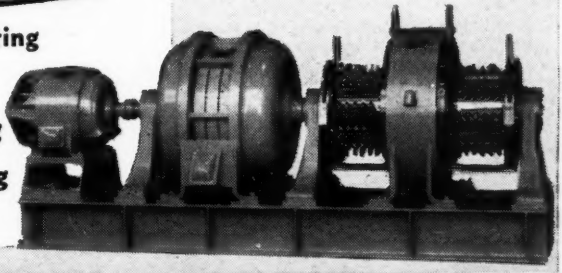

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Write for Catalog PF-700

Scroll-Aire Gas Fired Oven Heater for use on new or old paint drying ovens, core and mold ovens, moisture drying ovens, and industrial processing ovens is covered as to details of construction and operation in a four-page bulletin issued by the Newcomb-Detroit Co., 5741 Russell St., Detroit 11, Mich. Concise descriptions, photographs, and a cutaway view of the unit completely explain and illustrate the working principle of the heater that is available in four models, capacities and dimensions of which are included in the bulletin. Copy free upon request.

Interchemical Direct Reading Wet Film Thickness Gage, an instrument for measuring the wet film thickness of paint, varnish, lacquer, and related products, is illustrated and described in a six-page leaflet issued by the Henry A. Gardner Laboratory, Inc., Apparatus Division, 4723 Elm St., Bethesda, Md. Illustrations show the instrument being used to measure the thickness of railroad finishes, refrigerator enamels, steel bridge paints, battleship colors, automotive coatings, and so on. Copy free upon request.

Durco Corrosion-Resisting Y and Angle Valves. A four-page bulletin released by The Duriron Co., Inc., Dayton 1, Ohio, describes Durco Corrosion-Resisting Series 35 Y Valves and Series 36 Angle Valves and shows their internal construction by means of cutaway views. These illustrations bring out every construction detail of the valves and show in color which parts of the valves are made of a special corrosion-defeating Durco alloy. Features are listed and a brief explanation of the type of service for which the valves are best suited is provided. The bulletin also provides complete dimensional data on the various sizes and includes an illustrated parts list. In addition, the bulletin explains how the valves can be equipped with air-operated diaphragm motors for the automatic regulation of the flow of corrosive solutions. Copy of Bulletin 615 free upon request.

"Sel-Rex" Style 1509C Selenium Rectifier, a rectifying unit which is designed to utilize 9 volts and deliver 1,500 amperes for use in chrome and barrel plating, as well as electrocleaning, is illustrated and described in a bulletin now available free from the Bart-Messing Corp., 45 Morgan Ave., Brooklyn 6, New York.

LaMotte Service Bulletin. A four-page bulletin published by the LaMotte Chemical Products Co., Towson 4, Md., illustrates, describes, and presents price information on several control units available for immediate application, including pH control equipment, electroplating-corrosion control units, laboratory aids, and so on. Copy free upon request.

Porter-Cable C-6 Belt Grinder-Polisher is the subject of an eight-page two-color bulletin announced by the Porter-Cable Machine Co., 302-10 Wolf St., Syracuse 8, N. Y. The bulletin explains the principles of contour grinding and lists the benefits to be derived from this method of polishing contoured pieces of work on an especially shaped wheel. Various models of the C-6 grinder-polisher are shown, with complete specifications presented for each model. The bulletin is also illustrated with in-action photographs of the machine performing a variety of jobs. Copy of Bulletin No. 660 free upon request.

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"Shot Peening," 3rd Edition. Announcement has been made by the American Wheelabrator & Equipment Corp., Mishawaka, Ind., of the release of a new edition of its book, "Shot Peening." This edition, the third since the book was originally published in 1944, contains all of the information included in the earlier editions plus the addition of comprehensive papers on the subject by J. O. Almen of General Motors Research Laboratories and O. J. Horger of Timken Roller Bearing Company.

Mr. Horger's article presents a complete review of the history of shot peening and includes a thorough study of all literature on the subject as well as much original work by the author. Mr. Almen's paper discusses the use of shot peening for improving the fatigue strength of machine parts and devotes considerable space to a study of the theory of fatigue failures.

The first portion of the book remains essentially the same as the second edition and is devoted to a study of the practical application of shot peening, with particular emphasis given to the methods of handling the work and controlling the quality of the operation. The second part of the book, written by Professor H. F. Moore of the University of Illinois, discusses in considerable detail the theory of fatigue and how it is affected by shot peening.

This attractive 181-page book is nominally priced at $1.50 but will be sent without charge to interested mechanical executives addressing requests on their company letterheads.

Osborn Brushes. A three-color 76-page 8½ x 11-inch catalog presenting numerous illustrations of industrial brushing operations in addition to photographs and descriptions of a complete line of power, paint, varnish, and maintenance brushes has been issued by The Osborn Manufacturing Co., 5401 Hamilton Ave., Cleveland 14, Ohio. Included in the catalog are a three-page digest of the origin of Osborn brush materials from many parts of the world, a three-page section devoted to factors involved in selecting the proper brush for specific jobs, and data on operating equipment requirements, brush characteristics, operating conditions, surface speeds, and so on.

In addition to a quick reference index on the cover page, the catalog contains a numerical index by brush numbers, as well as the conventional alphabetical index. Copy of Catalog No. 200 free.

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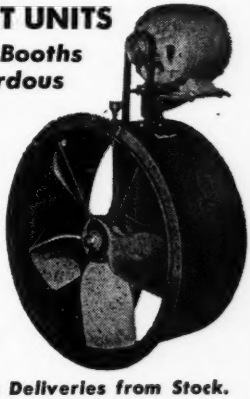

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